THE IRON AGE

239 West 39th St.,
New York

FRITZ J. FRANK, *President*

J. H. VAN DEVENTER
Editor

G. L. LACHER, *Managing Editor* — T. H. GERKEN, *News Editor* — R. E. MILLER, *Machinery Editor*

F. J. WINTERS — T. W. LIPPERT

A. I. FINDLEY, *Editor Emeritus* — L. W. MOFFETT, *Washington* — R. A. FISKE, *Chicago* — F. L. PRENTISS, *Cleveland*

G. EHRNSTROM, JR., *Pittsburgh* — BURNHAM FINNEY, *Detroit* — GERARD FRAZER, *Boston* — R. G. MCINTOSH, *Cincinnati*

Contents — April 18, 1935

Social Security Depends on Business Security 9
Highly Flexible Cylinder Block Equipment 10
Attractive Finish Helps Metal Products Sales 14
Massive Machine Parts of Welded Rolled Steel 18
Hardness Conversions for Carbon and Alloy Steels 20
Open-Hearth Technicians Review Developments 24
Late Returns From Laboratory and Mill 31
New Equipment 34
Activities Bearing on Machine Tools Distribution 39
Automotive Industry 42
News 45
Personals 47
Washington News 48
Statistics on Metal-Working Activity 56
Markets 57
Construction and Equipment Buying 78
Products Advertised 118
Index to Advertisers 138

C. S. BAUR, *General Advertising Manager*
A. H. DIX, *Manager, Reader Service*

Member, Audit Bureau of Circulations

Member, Associated Business Papers

Published every Thursday. Subscription Price: United States and Possessions, Mexico, Cuba, $6.00; Canada, $8.50, including duty; Foreign $12.00 a year. Single copy 25 cents.

Cable Address, "Ironage, N. Y."

Owned, Published and Copyrighted by

CHILTON COMPANY
(Incorporated)

Executive and Publication Offices,
Chestnut and 56th Sts., Philadelphia, Pa.

C. A. MUSSELMAN, President
FRITZ J. FRANK, Executive Vice-President
FREDERIC C. STEVENS, Vice-President
JOSEPH S. HILDRETH, "
GEORGE H. GRIFFITHS, "
EVERIT B. TERHUNE, "
ERNEST C. HASTINGS, "
WILLIAM A. BARBER, Treasurer
JOHN BLAIR MOFFETT, Secretary

ADVERTISING STAFF

Emerson Findley, 311 Union Bldg., Cleveland
B. L. Herman, 675 Delaware Ave., Buffalo, N. Y.
H. K. Hottenstein, 802 Otis Bldg., Chicago
Peirce Lewis, 7310 Woodward Ave., Detroit
Charles Lundberg, Chilton Bldg., Chestnut & 56th Sts., Philadelphia, Pa.
C. H. Ober, 239 W. 39th St., New York
W. B. Robinson, 428 Park Bldg., Pittsburgh
W. C. Sweetser, 239 West 39th St., New York
D. C. Warren, P. O. Box 81, Hartford, Conn.

Ryerson Specializing on the finer Steels—

Your competitors are burning the midnight oil economizing—improving their products. So are you! And it is the newer, finer steels that are accomplishing miracles. The new stainless steels, high manganese alloys, new process tool steels, special accuracy bars, etc., etc.—these and many others are responsible.

For this reason the Ryerson Special Steel Divisions are working overtime helping manufacturers whenever the problem of steel arises. We have an experienced group of special steel men awaiting your beck and call, and we hope you will take full advantage of this most important service.

Do not let well enough alone. Do not be too easily satisfied. Call on Ryerson for suggestions that will economize and improve your product. We will be glad to help you.

The Ryerson Stock List is your guide to the most complete stocks of steel and allied products carried for immediate shipment.

NOTE: See the new S. A. E. Specifications in the new Ryerson Stock List. If you do not have a copy write and we will be glad to send one at once.

NOW—Permite Phosphor Bronze Bearing Bars in 6 ft. Lengths

The New Leaded Phosphor Bronze Bearing stock for screw machine and turret lathe production. Write for Bulletin.

HOT ROLLED ALLOYS
S.A.E. 2315, 2320, 2330, 2335, 2340, 2345, 2350, 3115, 3120, 3130, 3135, 3140, 3250, 4140, etc.
Rycase (Hot Rolled, machine Straightened)
Rytense (Hot Rolled, machine Straightened)

COLD DRAWN ALLOYS
S.A.E. 2315, 2320, 2330, 3115, 3120, 3135, 3140, etc.

HEAT TREATED ALLOYS
Ryco (Hot Rolled, machine Straightened)
Nikrome (Hot Rolled and cold drawn)

STAINLESS AND HEAT RESISTING ALLOYS
Allegheny Metals (Sheets, Bars, Welding Rod, etc.)

COLD FISHISHED STEELS
Std. Shafting, Turned Ground and Polished, Special Accuracy Stock, Rycase High Manganese Screw Stock, S.A.E. 1112, 1120, etc.

TOOL STEELS
Ryerson XXX, XX, X
Ryerson B.F.D., Die Steel
"4-Point" Chisel Steel
High Speed Mill Treated Bars
Diamond B
Carbon Steel Drill Rod

GENERAL STEEL PRODUCTS
Bars, Structural, Plates, Sheets, Shafting, Strip Steel, Welding Rod, Tubes, Babbitt Metal, bolts, nails, etc., are also carried in stock for immediate shipment.

JOSEPH T. RYERSON & SON, INC.
Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON
STEEL-SERVICE

... THE IRON AGE ...

APRIL 18, 1935

ESTABLISHED 1855 Vol. 135, No. 16

Social Security Depends on Business Security

NO enlightened American questions the desirability of greater social security; nor will he oppose sound measures to promote that end. But many business men, at the risk of being misunderstood, have expressed doubts as to the extent that legislation can insure society against economic hazards.

Why these doubts? Because the fundamental basis for social security has been overlooked.

In the depression years there has been frequent resort to legislative enactment and Administrative mandate in an effort to improve the economic condition of large groups of our population, but the results achieved have not come up to expectations. The problem of unemployment remains unsolved; want still stalks millions.

The explanation is to be found in the fact, still largely ignored but nevertheless inescapable, that recovery and social security alike depend on business security.

Business does not demand protection from all risks. On the contrary, the conduct of private enterprise implies taking a chance. But capital must be granted reasonable assurance of gain before it will venture into undertakings that spell activity and employment.

And capital is not synonymous with extreme wealth. Many thousands of hard-working, thrifty people of modest means have invested their savings in business and industry. Many thousands more are indirectly dependent on business profits through insurance companies, our greatest investing agencies. The interests of this large group are as deserving of consideration as those of labor or of the debtor class.

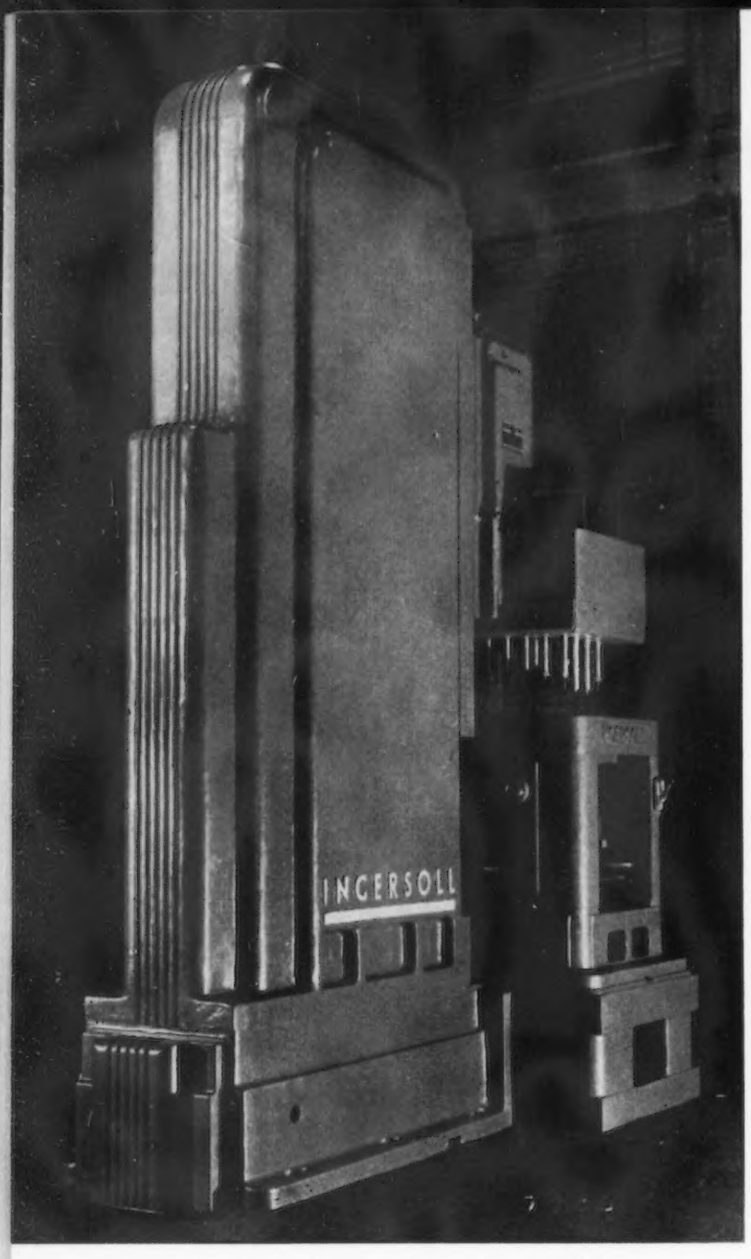
Emergency relief has been given in certain circumstances to debtors, and properly so, and wages have been commonly given precedence over dividends, but there are limits to all things. The shareholder has waited his turn and waited patiently, but he will not take new risks without some prospect of a return. Nor will corporate managements make expenditures for needed improvements unless they can see a way of paying for them.

In normal times the railroads are huge purchasers of materials and equipment. They have just been granted a rate increase, but the expected gain in revenues will be offset in large part by an advance in wage rates. In the case of the railroads an accomplished fact, rather than fear, impedes a revival of buying power. With many other enterprises apprehension over what organized labor or Washington may do, rather than what they have actually done, is quite as effectively holding back purchases.

It is probably significant that, in a recent trip made by the writer, business activity accelerated as the distance from the loudspeakers in the national capital lengthened. Present uncertainty, in most of its phases, is of political origin. If those who would legislate us into social security would give more heed to business security they would achieve their avowed aim sooner.

G. L. LACHER

Managing Editor, The Iron Age



BEAUTY of design, as well as utility, is built into this one-way vertical multiple drill.

Packard Installs Highly Flexible Cylinder Block Equipment

o o o

By BURNHAM FINNEY
Detroit Editor, THE IRON AGE

o o o

KEEN competition for the consumer's dollar, especially since purchasing power has been below normal in the depression years, has led to quick shifts in the design of products and hence to necessary changes in manufacturing methods. These shifts must be made with due regard for the fact that retail prices cannot be advanced much without restricting markets and that costs of materials and labor have risen substantially under NRA. The situation, then, is one in which management no longer can afford to pour out unlimited sums of money (except in a few extraordinary cases) for equipment which must be written off within a year or two. Yet management realizes that, more than ever before, it must avail itself of economies resulting from use of the most modern equipment.

This was the problem which faced the Packard Motor Car Co., Detroit, when it decided to expand its line of cars to include a lower-price eight to be known as the One Hundred Twenty. It wanted machinery which would do a specified job at lowest cost without occasion for discarding it when model changes were made. It wanted machinery which can easily and simply be converted from one type of equipment to another, with a minimum of delay. It wanted machinery which in case of a breakdown could be put into commission again in short order without dis-

rupting the even flow of parts through the plant.

It installed a line for machining the One Hundred Twenty cylinder block consisting of 50 Power Pack machines built by the Ingersoll Milling Machine Co., Rockford, Ill. This line was sold to Packard as a complete functioning unit capable of producing machined blocks at the rate of 30 an hour and at an agreed-upon direct labor cost plus a specified degree of accuracy.

The Packard line is regarded as establishing two precedents in machine shop practice. It marks the first time that a complete production line has been built up of common elements in machines and fixtures, including machines using differing processes of removing metal, which are approximately 85 per cent salvageable in case changes in the design of the block should be made later. It also is the first time that a serious effort has been made to embody artistry as well as utility in a group of machine tools. And it might be added that the modernistic effect created by the equipment, much after the manner of the architecture predominant at the Century of Progress, has given to the Packard factory a pleasing appearance without any extra cost.

Single-purpose machines, if they must be junked at the end of a production run, are costly. Their lack of adaptation to more than one job unfits them for use in most shops. On the other hand, some standard machine tools are but little better from the standpoint of flexibility. Ingersoll, in connection with the Packard plant, has now applied to a production line on a large scale ideas of interchangeability of units developed over the last five years.

The versatility of the machine tools used in the new Packard line is due to the fact that their range can be increased (table travel, gearing, adjustable heads), their angle of approach changed and their size increased (converting a one-way horizontal drilling machine into a three-way vertical machine), and the method of removing metal changed (milling machine can be converted into a drilling machine). All of these desirable features are obtained through the use of seven common elements comprising every Ingersoll machine in the Packard plant: the fixture pedestal, bed wing, slide, saddle, Power Pack, work unit, and fixture.

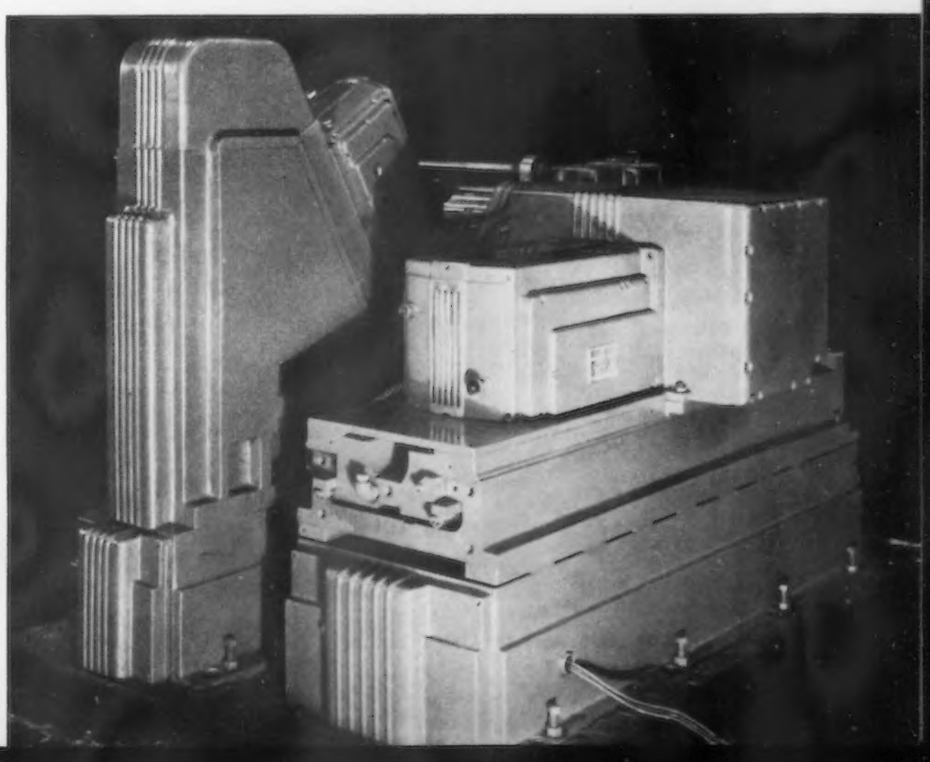
PACKARD has installed the lowest cost cylinder block line in the automobile industry. The equipment, consisting of 50 Power Pack machines, is approximately 85 per cent salvageable, consequently it will not have to be discarded when models are changed. It can be converted from one type of equipment to another with a minimum of delay. It embodies artistry as well as utility, thus giving a pleasing appearance to the Packard factory.

Each element performs a specified function and is self-contained, although the Power Pack itself has a multiplicity of functions.

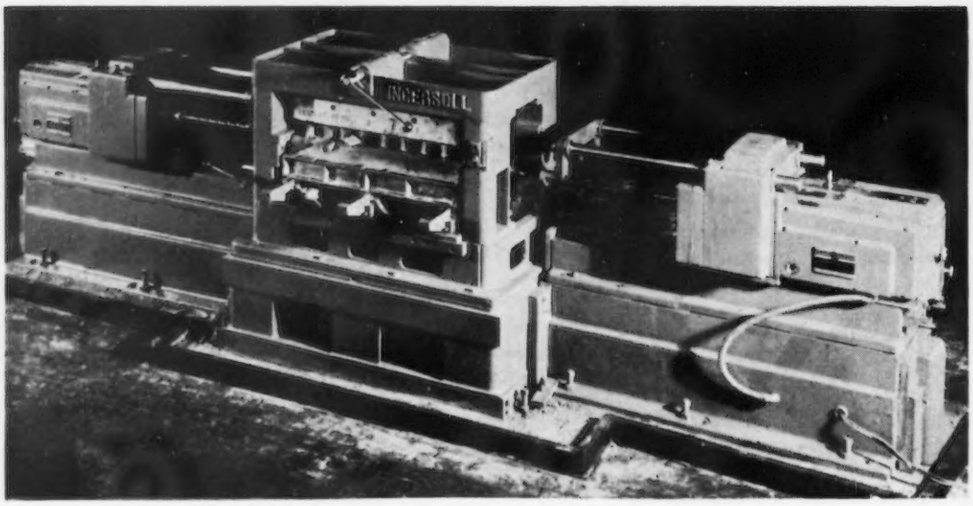
The Power Pack is an all-electric unit providing driving and feeding power for the work to be done. It contains the control mechanism for governing the feed cycle. thus eliminating all external connections. The cycles for drilling, tapping, boring, and milling are governed by the position of a small handle protruding from the case. The fixture pedestal raises the work to a convenient working height and is wired on all four sides for easy "plugging in" on an electric circuit. The bed wing raises the machine to the same convenient working height. The slide allows the cutting tools to approach the work and retreat from it. The saddle provides a means for carrying the Power Pack and work unit on the slide. The work unit carries the tools and the fixture holds the work.

The Power Pack contains 90 per cent of the mechanism of the entire machine and in case of trouble can be replaced in 20 min. One in reserve in a shop is plenty. Ingersoll has so designed its drilling machines that they can be converted into tapping machines by turning a button at one end of the Power Pack. Like the machines, the fixtures are made out of common elements, 26 in number. Altogether, the Packard line of 50 machines has been built up from 33 machine elements.

Construction of the machines at Packard is shown in the accompanying phantom view of a three-way vertical drilling machine. The machine consists of a fixture pedestal, three bed wings, a vertical housing, three slides, three saddles, three Power Packs, three work units and one fixture. This machine could be changed into a horizontal machine in 8 hr. Any one of the three Power Pack units



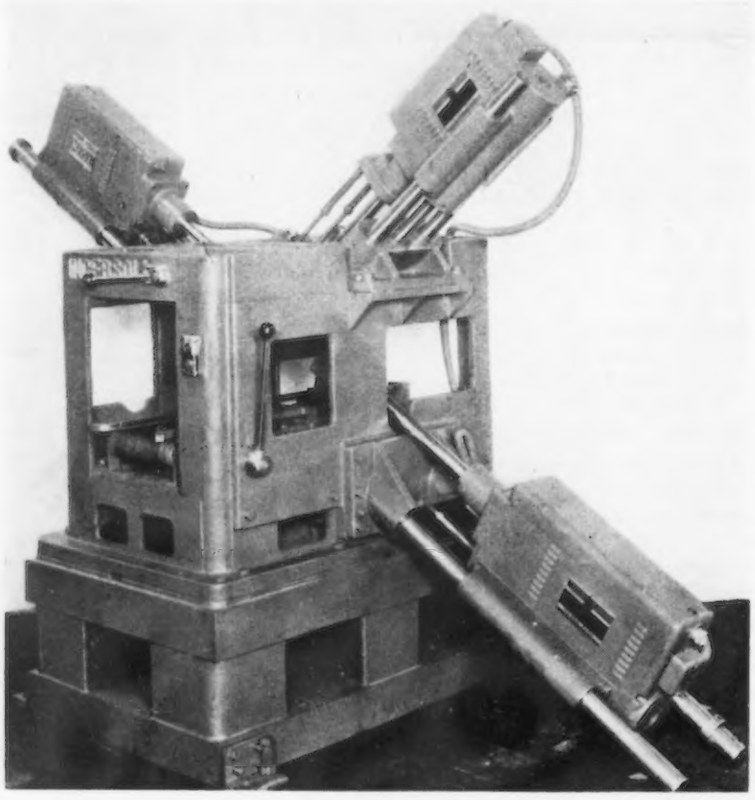
A POWER Pack milling machine with three traveling heads, two horizontal and one angular.



A TWO-WAY four spindle drill, equipped with two 5-hp. Power Pack units, is used to drill the long oil holes in two cylinder blocks.

o o o

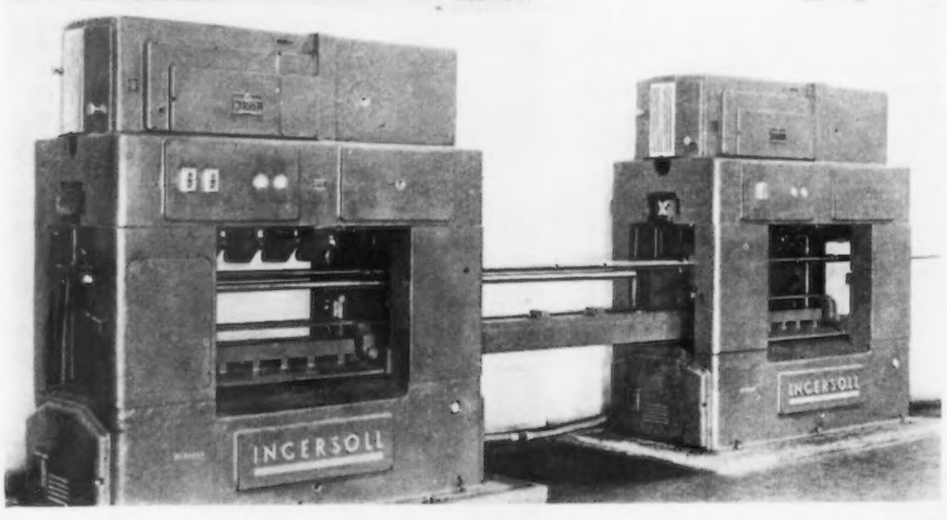
SEVERAL machines consist of Power Pack units attached at the proper angle to a fixture built over the conveyor line. Here is an example of a three-way



three-spindle drilling machine for rough drilling the oil pump hole, the distributor hole and the pump suction hole.

o o o

THE cam and crank lines are rough and finish bored on two 10-spindle boring machines equipped with 30-hp. Power Packs. The blocks are inserted upside down, each machine having an elevating device for clamping the block in position.



can be removed and a new one inserted in 20 min.

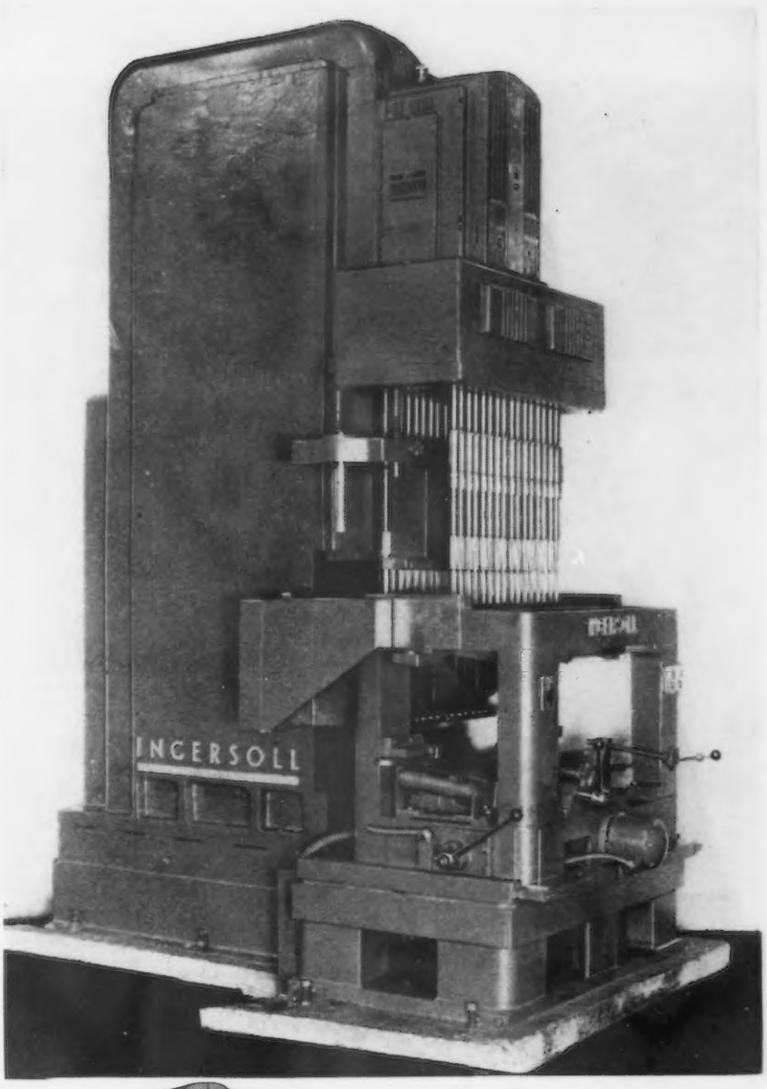
Several machines in the line consist of Power Pack units attached at the proper angle to a fixture built over the conveyor line. An example is a three-way three-spindle drilling machine for rough drilling the oil pump hole, the distributor hole and the pump suction hole. The machine is made up of a fixture, one 1-hp. Power Pack and two 3-hp. Power Packs.

A roller conveyor along which cylinder blocks move from one operation to the next is an integral part of the Packard line. In some cases the conveyor passes through machines so that the straight line movement of blocks is not interrupted. Wherever blocks must be shunted off the main conveyor into machines, they are rolled along a "cut-off" directly into the proper work position without the necessity of being lifted by hoists or

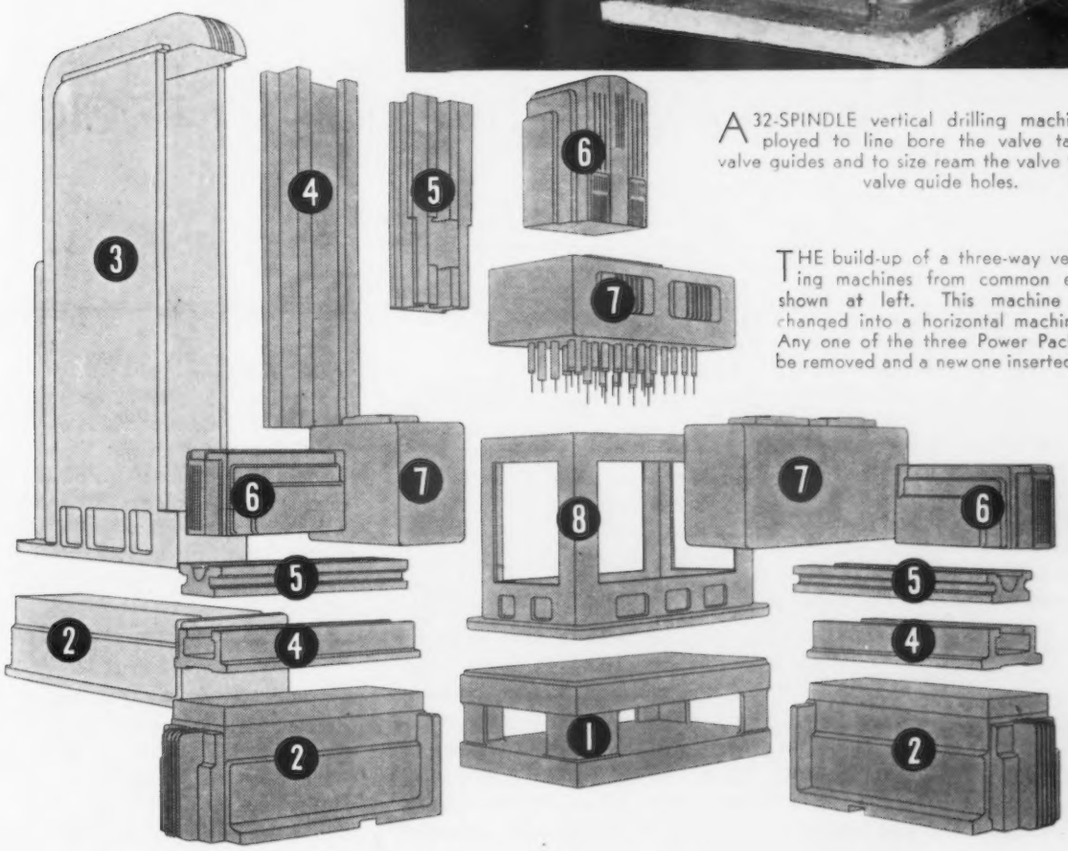
by hand. Incidentally, the legs of the conveyor structure are designed so as to fit into the modernistic scheme of the machines themselves.

The Power Pack type of equipment, protected by patents, has been tested thoroughly under production conditions. The first installation was at the White Motor Co. in Cleveland for machining its Pancake engine and the second at the Citroen plant in France. Because of improvements made in the last year or two, the Packard installation has the distinction of being the most modern and the most complete as well as the lowest cost line yet built.

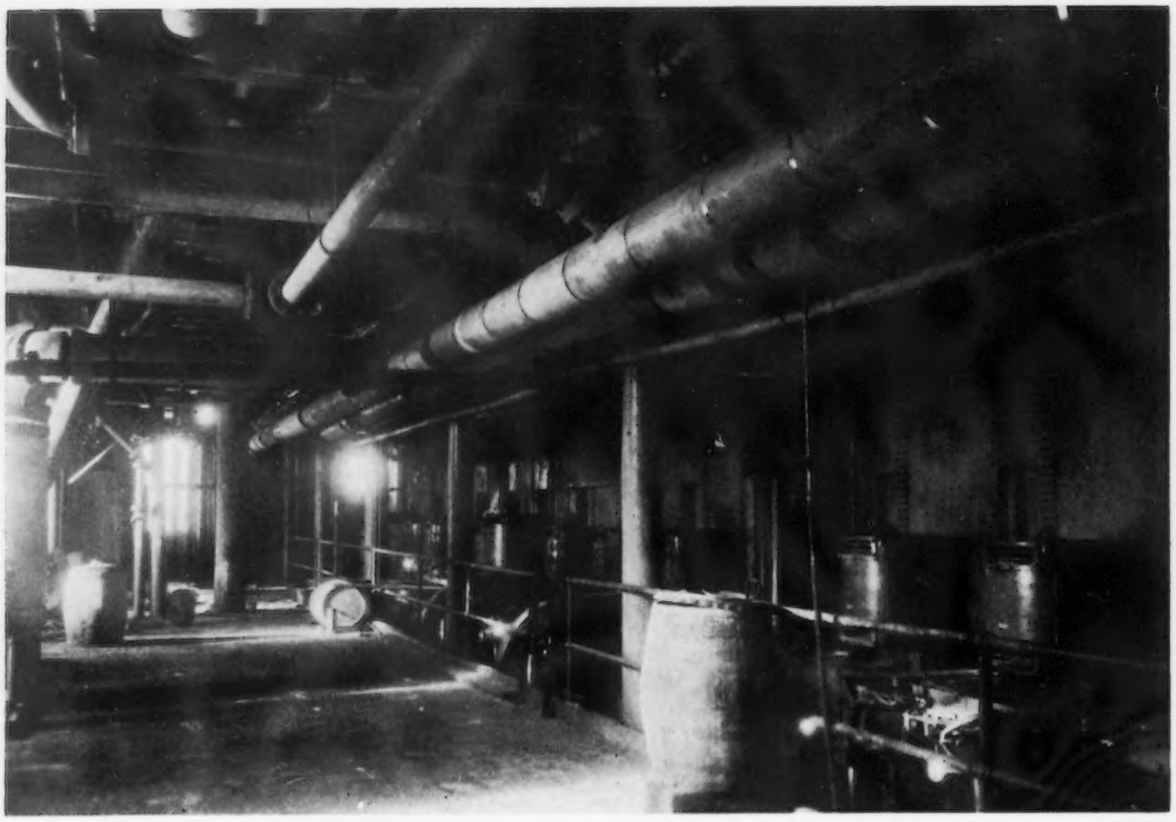
Unique in machine tool practice was the setting up of the entire cylinder block line at the Ingersoll plant in Rockford prior to its shipment to Packard at Detroit. Four hundred blocks were run through the line to see that everything was functioning smoothly and to insure Packard an ample supply of blocks at a time when it was anxious to get into production of its One Hundred Twenty models as rapidly as possible.



A 32-SPINDLE vertical drilling machine is employed to line bore the valve tappets and valve guides and to size ream the valve tappet and valve guide holes.



THE build-up of a three-way vertical drilling machines from common elements is shown at left. This machine could be changed into a horizontal machine in 8 hr. Any one of the three Power Pack units can be removed and a new one inserted in 20 min.



THESE two views are a study in contrasts before and after the use of bright paint.
Courtesy Sherwin-Williams Co. o o o

How Attractive Finish Helps

Painting As An Aid To Production

NEARLY 85 per cent of all our impressions are received through our eyes, according to the Better Vision Institute. When we consider this we become aware that light and shade and color are of more significance in our lives than we had thought. In industry it is safe to say that the importance of the quality and intensity of light is seldom exaggerated, and that even those who are "lighting conscious" usually stop half way of the ultimate goal. To the shop worker following through production operations, obliged to read micrometers or perform any of the many difficult visual tasks of industrial occupation, the energy output and time wasted are excessive and costly where illumination is either inadequate or of the wrong sort.

Poor visibility has its source in three factors: first, in insufficient daylight; second, in insufficient artificial light; and, third, in the poor control of both. The principal factors in the control of day or artificial light are: suitable reflecting surfaces, sufficient diffusing of light by glass diffusers, the use of paints sufficiently matte to avoid specular or mirror-like reflections, and the elimination of exposed lamp bulbs and of sharp contrasts between light and dark areas.

From this it may be judged that the proper use of paint in a shop may be a production aid of no mean value. In actual practice, paint and lighting must go hand in hand to give efficient illumination and high manufacturing output. Thus a foundry avoided having to cut new windows in an old building by the liberal use of bright-colored paint.

AN attractive finish on a machine tool may increase sales, but it has a utilitarian value as well. It will help the man who operates the tool to produce neat, accurate work. It will increase his output and better his morale. The same thing is true not only of tools but of all shop equipment including

Metal Products Sales

By J. O. HASSON
Head, Industrial Division
The Sherwin-Williams Co.

walls and fixtures. Bright, pleasing colors help production. And so this article, which tells how paint can be made to pay its way in a manufacturing plant, is included in this series even though it deals but indirectly with sales. This is the thirty-fifth article of a series on metal finishing.

and whenever more daylight or more artificial light is needed, paint can usually be counted on to furnish part of it.

Machine tool builders have found that the use of contrasting colors for moving and stationary parts actually increases the speed of production of a tool by giving the operator more confidence in his movements. The same result may be secured on a larger scale by proper selection of colors for an entire shop. In fact, someone has said that paint in a plant is as much a production agent as a lathe or shaper.

In various tests conducted by K. A. Staley, Walter Sturrock, Ward Harrison, and others of the Nela Park Engineering Department of the General Electric Co., it was found that differences of several seconds resulted in the performance of even the simplest visual tasks where seeing conditions were favorable in one case and poor in another. Not only are visual responses much slower, they are less accurate; and moving objects appear to be traveling much faster where illumination is poor. This means increased spoilage and a greater number of accidents. According to Jo Chamberlin, writing in Review of Reviews for September, 1934, from recent research "It is estimated that manufacturers in the U. S. lose a billion dollars a year because of industrial accidents; $150,000,000 of this can be charged to poor illumination."

The census experts investigating 268,491 plants having a total annual output of $20,000,000,000, found that spoilage in these plants totaled the staggering sum of $150,000,000. This spoilage was

considered due in a large measure to poor visibility. Yet these figures take no account of wasted human energy, ruined eyesight, or losses from a retarded rate of production.

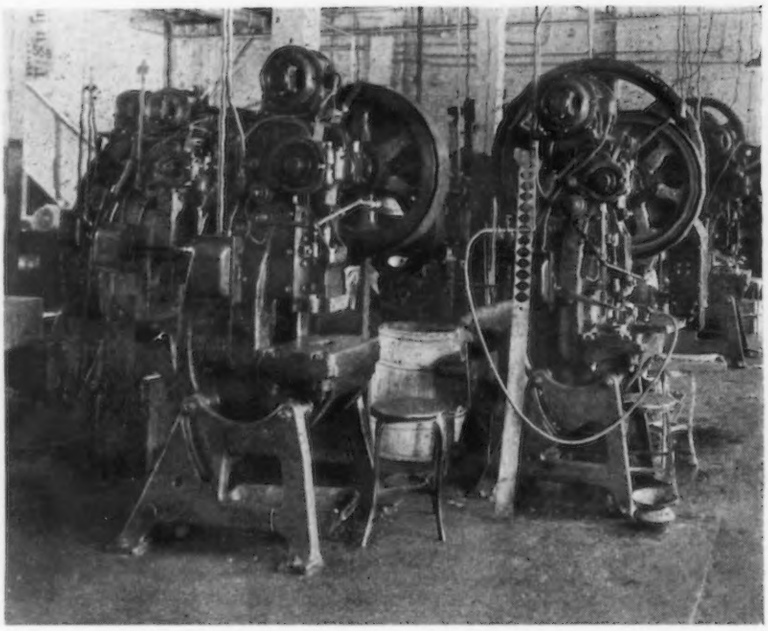
Intensity of Light

Inasmuch as the major portion of useful light is reflected from upper walls and ceilings, the use of a paint with a high reflection value is fundamental from the standpoint of good seeing, and in the interest of economical production and lighting. With the aid of the foot-candle or sight-meter instruments that measure the intensity of illumination by means of a photo-electric cell, we can obtain a physical measurement of light that is far more accurate than that of the human eye. Tests conducted by the Sherwin-Williams Co. using these instruments and utilizing indirect illumination in three miniature rooms identical in every respect save for the wall and ceiling surfaces, showed the extremely low reading of but 2 foot-candles for the unpainted brick walls, 5 foot-candles for the painted though dirty and dingy walls, and a jump to 22½ foot-candles for the new white painted walls. The differences, though less in the case of direct illumination, are still surprisingly large.

George Kramer, superintendent of the Standard Textile Products Co., says: "We figure that paint is saving us about 40 per cent on lighting bills." At the same time this company has increased the level of illumination from 8 to 14 foot-candles merely by the application of white paint to upper areas.

Good grades of white paint have a reflection value as high as 82-89 per cent. From tests made by the New Jersey Zinc Co. in rooms equipped with indirect lighting, a white room reflected 67 per cent more light than an identical room in yellow, 78 per cent more light than a like room in green, and 89 per cent more light than the identical room in gray. These colors were all light tints having a white base.

For delicate operations, for reading scales, or for handling non-contrasting materials, it is increasingly important that the level of illumination over the entire floor area be kept high. The eye sees by reflected light and differentiates by color contrasts. Sight-meter readings normally high for ordinary work on fairly light surfaces must therefore be increased where contrast is low and but little light is reflected from the darker, light-absorbing colors.



DULL colored machine tools do not inspire the operator to be a good housekeeper.
Courtesy Toledo Scale Co. o o o

Avoiding Glare

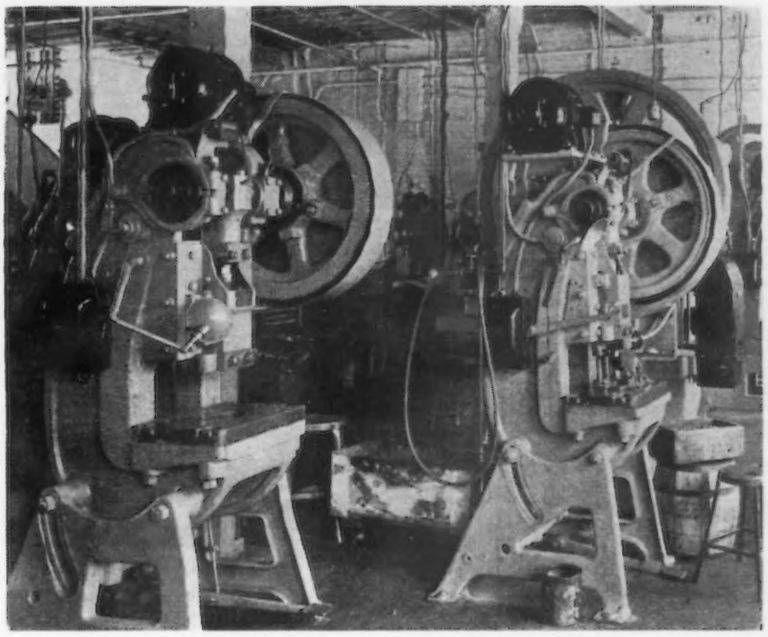
Actually a sight-meter reading taken at the point of the cutting tool on a lathe may show high, yet the visibility be low because the object to be seen is dark or because of intense light, in the eyes of the operator, coming from windows or a lamp bulb. The pupil of the eye contracts to shut out the glare and thus the operator may be working partially blinded. Higher levels of general illumination will reduce this glare from dark and light areas. It is the comparison of seeing an automobile headlight burning in daylight as opposed to night time. The less difference there is between the intensities of local and general illumination, the easier the visibility and the greater the efficiency, provided both levels are sufficiently high to meet visual requirements.

The level of illumination will be markedly increased and glare avoided by using flat or egg-shell paints having high reflection values. The more matte the surface, the greater diffusion or scattering of the light rays. This type of reflection avoids the annoyance from specular or mirror-like reflection common to highly polished or gloss surfaces. Where gloss paints are desirable from a maintenance standpoint, annoyance from specular reflection may be overcome by the use of diffusing or frosted glass windows in the event sun rays are strong and direct, and by the use of opal or other diffusing luminaries for the control of artificial light. Both gloss and egg-shell paints are washable and should be washed to maintain high reflection value.

Courts offer another opportunity for an increase in the level of illumination in rooms opening from them. It has been proved that "daylight illumination in the interior of a room at the bottom of a closed court can be increased 20 times by painting the dark-colored court walls with a white or light tint paint," according to C. R. Randall and A. H. Martin in an article which appeared in *Transactions* of the Illuminating Engineering Society.

Use of Color

Color applied to lower walls and to machinery and equipment is one important phase of plant operation and maintenance that has only begun to receive its due consideration. Applied to lower walls, color beautifies, and if a soft, pleasing shade is chosen it will prove of defi-



THIS shows the same two presses as in illustration on opposite page, after they have been painted in bright contrasting colors. By this means alone, the output was appreciably improved in quality and amount.

Courtesy Toledo Scale Co.

o o o

nite psychological advantage to both men and women workers. Restful colors such as soft greens or buffs will also afford the desired relief to eyes that might be fatigued by too bright walls at eye level.

Borrowing a bit from the modern and colorful family kitchen, a number of companies have adopted various colors that depart radically from the drab and depressing machine gray and black. Some manufacturers of machinery report that pastel greens, softened oranges, buffs and other colors are being specified by present purchasers who find the dressed-up product combines good appearance with improved employee esprit and production capacity. Not only do operators take real pride in colorful equipment, but they work better and more efficiently, for there are practical aspects as well as esthetic in the adoption of color.

On a lathe it becomes distinctly easier to see cuts if the paint chosen has a fair light reflection value. One radio tube manufacturer adopted orange paint to make stemming machines stand out against the blues and the greens of the gas flames. Pastel blue was adopted in his hot room for the cooler feeling it created in the minds of the operators, and there were fewer complaints. The result of this painting program was a 60 per cent reduction in tube rejections during the first week.

The Freeman Shoe Co. has adopted colors for machines to lend contrast to the colors of the leathers being handled. As a result, complaints from eyestrain have been overcome and finer workmanship has been made possible at a faster rate.

The Simonds Saw & Steel Co., Toledo Scale Co., Pratt & Whitney Co., Packard Motor Car Co., American Rolling Mill Co., to name but a few, have all adopted color on machinery and agree that color is both psychologically and economically justified. Danger zones are usually marked with red. Operating levers are given sharp contrasting finishes to facilitate quick and precise handling. Pipes and conduits that are against walls or ceilings are usually painted the color of those surfaces and identified by color bands. Heat treating rooms are usually done in blue to reduce complaints from heat. Rest rooms, cafeterias and other rooms are done in restful and cheerful colors.

Psychology and Production

Logically the difference in productivity of two men performing like operations on identical machines will depend upon the difference in their states of mind. If a plant in which a man spends half of his wakeful hours is cheerful and pleasant he will work better. Contrasting colors applied to moving parts will facilitate accurate handling and promote safety. Industry has learned its first lessons in applying attractive and colorful finishes to its products to make them presentable and saleable. Good housekeeping methods and colorful surroundings have similar weight within the industry in selling an organization and its methods to both employees and customers. It also makes possible acquiring a higher type of employee at lower wage limits.

As the move to adopt white paint and colors spreads more and more, facts and figures are piling up to prove there is a great deal more in a can of paint than just paint!

Paint and Maintenance

From a strict maintenance standpoint, paints remain an outstanding factor and their proper selection means just as much in the reduction of maintenance costs as does the application of paint to reduce costs from corrosion and rotting. The major problem in industry is the protection of iron and steel from the ravages of corrosion. Something like $100,000,000 is estimated to be the annual loss from corrosion in this country alone. The loss would be even greater were measures not taken to prevent corrosion. Paint remains the most universally satisfactory means of prevention, but paints vary in their anti-corrosion properties and in their life. Some paints actually induce corrosion.

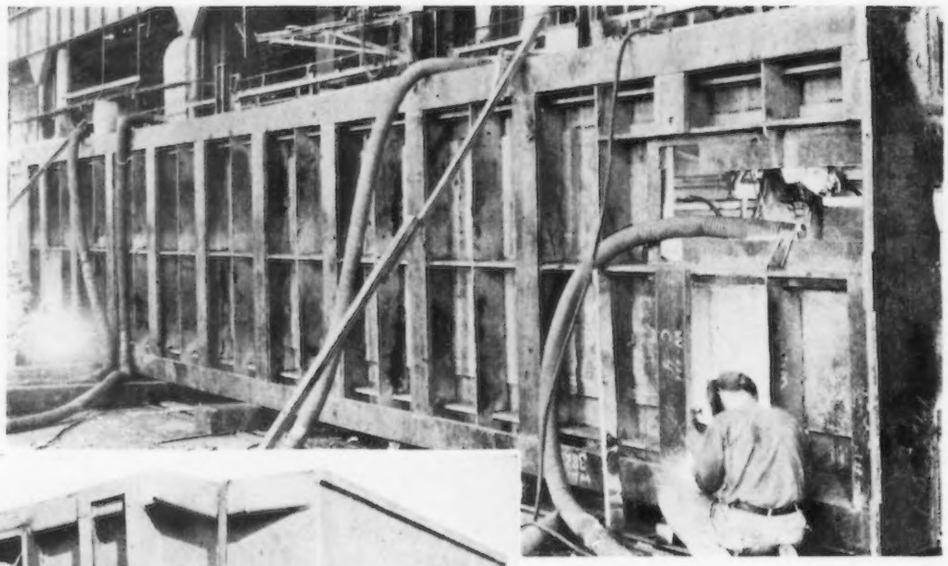
According to Henry A. Gardner, chief of the scientific section of the Paint Manufacturing Association of the United States, who has made tests on various paint pigments. American Vermillion (basic lead chromate) is superior to all other steel or iron primer paints. Sublimed blue lead ranked slightly lower. Red lead having up to 10 per cent litharge added to it stood up better than a straight red lead pigment. Not only did the lead chromate base paint surpass all others, but, properly made, it applies more easily by brush or spray, due to the lighter pigment, and it is less expensive than good red lead primers. Other advantages of the lead chromate base primer are: ability to stand months of weathering preceding finishing coats, abil-

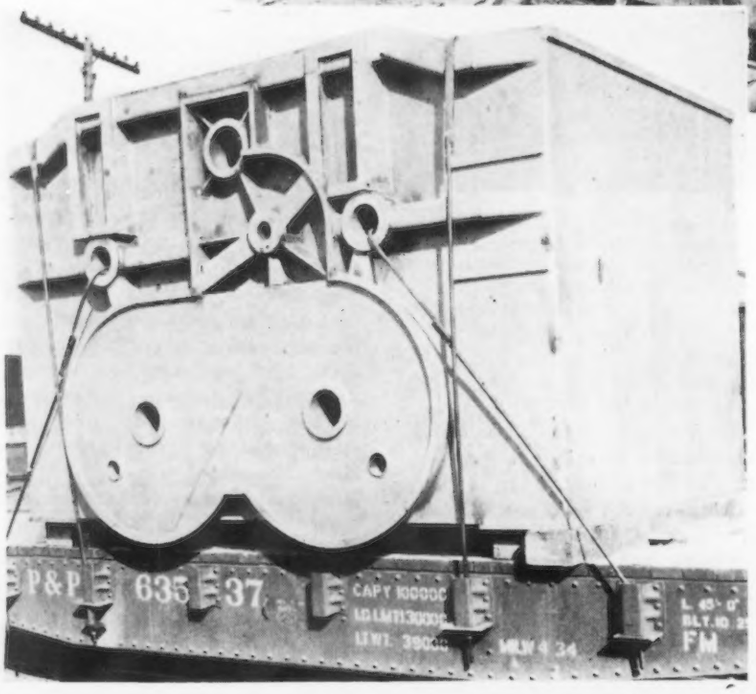
(CONTINUED ON PAGE 72)

o o o

BOTTOM view of the 43-ft. front end section of the milling machine bed. This part weighs 56,000 lb.

o o o





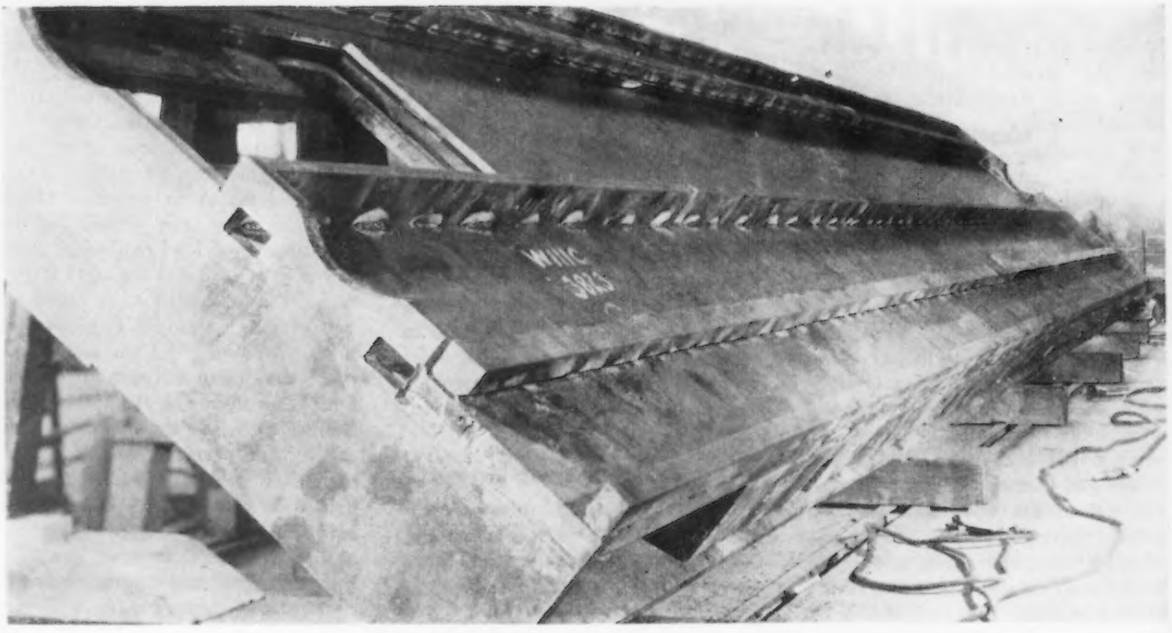
AT LEFT

BUILT-UP crown for a 132-in. triple-action press. In this part cast steel guides are welded in place. The finished part weighs 77,000 lbs. and it measures 116½ in. by 130½ in. by 179 in.

o o o

BELOW

THIS 43-ft. front end section for an 85-ft. milling machine is constructed entirely of rolled steel sections. Tack welds for set-up purposes can be seen along the longitudinal members.



Massive Machine Parts Made Of Welded Rolled Steel

RAPID strides in the use of rolled steel sections which are cut and built up by welding into complicated and massive machine parts are well illustrated in the accompanying pictures. The character or ultimate use of the part to be made is of prime importance in the study of design, and therefore the problems involved center not alone on welding and shop practices, but also on what is expected of the machine and its component parts. These factors determine stresses and the general character of design. Then follow the layout and weld design which determine cooling stresses that must be controlled, so that the part when ready for the normalizing furnace is no more distorted or under stress than the best practice permits. Flame cutting or shaping is employed for some members, and edges are scarfed by machine to assure clean metal welding surfaces. Laying-out is accurately performed and proper tacking is extremely necessary if the final assembly is to turn out accurate to all dimensions.

The use of rolled steel sections for a main part of a machine does not in any way limit the

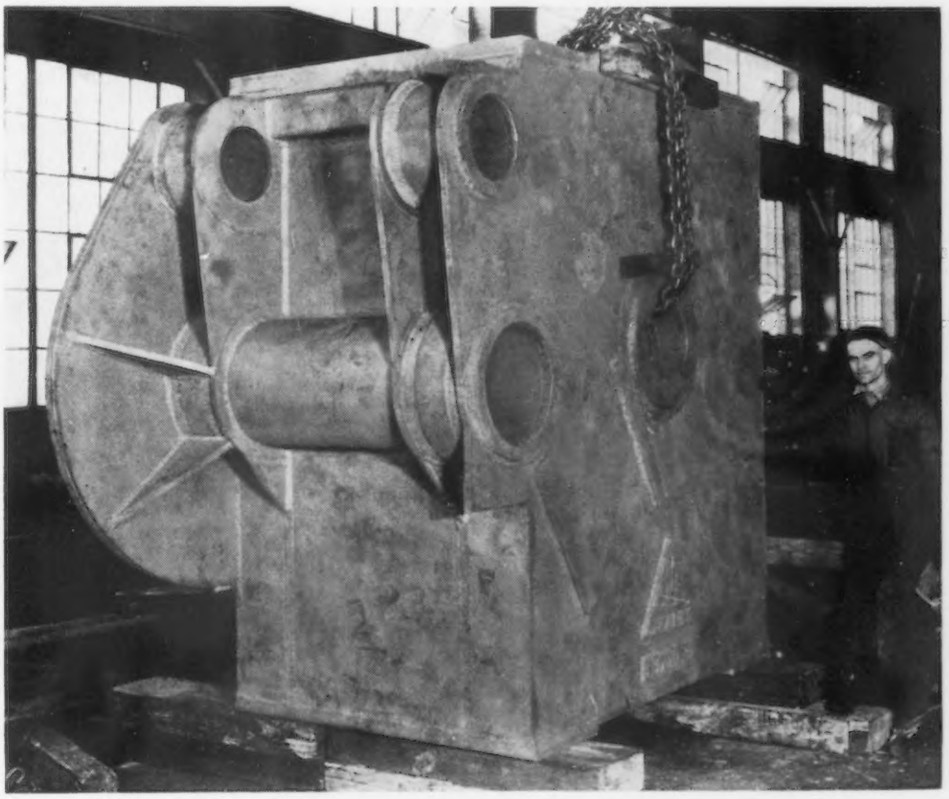
By ROGERS A. FISKE
Western Editor, The Iron Age

° ° °

use of castings where castings are advantageous. At the plant of Danly Machine Specialties, Inc., Chicago, and of the A. O. Smith Corpn., Milwaukee, where the electric arc welding process of the A. O. Smith Corpn. is used by both companies under cooperative agreement, castings are often welded to rolled steel members after giving special attention to the design of the casting, its placement in the machine part and the actual weld. Any skimping in proportions and design of the cast part results in a situation in which the weld, no matter how perfectly fused, as well as adjacent members are worked under stress and conditions that are prohibitive to satisfactory and extended service. By careful layout, welding and normalizing it is entirely practicable to locate castings of large diameter and long length for bearings or guides, so that a minimum amount of stock need be allowed for machining the bore.

Normalizing plays two impor-

(CONCLUDED ON PAGE 96)



WELDED steel crown for a 700-ton press. Its weight is 19,700 lb.

Hardness Conversions for Carbon

SOME technicians are opposed to the utilization of hardness conversion tables or diagrams, but the importance and value of this work have never been more clearly demonstrated than in the last two or three years of industrial stagnation. New developments and improvements of existing methods have broadened the scope of hardness testing beyond the capacities of even fairly complete testing laboratories. These conditions as well as simple plant economy have brought about considerable interest as well as the greatest possible precision in the compilation of comparative hardness tests carried out for the benefit of those seeking data on the relative magnitudes of various hardness numerals.

Since the advent of modern hardness testing of metals over 30 original studies on the conversion of hardness numbers, have been presented to the world's technical press, the first dating back to 1909. In reviewing the contents of this initial paper, it is interesting to note that the need for some unification of hardness numerals was felt even at that early date. In order to show some proportionality of the then known hardness numbers, the Brinell values were divided by six and the resulting quotient compared with the relative Shore indices. The first two columns in Table I indicate some of the original data for a few ferrous materials. Contrary to the contention of some investigators, scratch hardness—as determined by Turner's sclerometer—is also in good agreement with the foregoing methods, of which the third column in the mentioned table is ample proof.

In his 1909 paper Turner deduced from his researches of the subject that the indentation, scratch, and non-deformative hardness testing instruments "must measure one and the same physical property," giving "results which are either in actual agreement with, or proportional to, the results obtained by the other forms of tests."

MANY studies have been made to obtain accurate conversions of hardness numerals. However, the usual procedure has been to compare only a few of the better known testing methods, and the data of various investigators have shown surprising variations. This article reviews all of the usual testing methods, and the accompanying table gives comparative figures which are believed to be the most accurate yet assembled. Not only has the author conducted many thousands of tests of a comparative nature, but he has also assembled all the data of other investigators in order to secure the most representative results.

TABLE I

Turner's Conversion for Three Hardness Scales

Metal	Brinell numbers divided by 6	Scleroscope hardness	Sclerometric hardness
Softest Iron	14.5	....	15.0
Mild Steel	16 to 24	22.0	21.0
Soft Cast Iron	24.0	24.0	21 to 24
Rail Steel	26 to 35	27.0	24.0
Hard Cast Iron	35.0	40.0	36.0
Hard White Iron	75.0	70.0	72.0
Hardened Steel	93.0	95.0	....

Modern precision testing of hardness seems to point distinctly towards the existence of more accurate relationships between the contemporary methods of testing than has been surmised in the past. Even though the term "hardness" may denote—according to Bierbaum—five different properties, actual data disclose that our present conception of the property known as "hardness" is quite clear. This contention is irrespective of the fact that physicists and philologists have failed so far to set forth a unanimously acceptable definition for it. The main difficulty in coordinating the various known methods of hardness testing seems to consist in mechanical and human variables rather than in some fundamentally wrong principle in the design of the most commonly used machines for the testing of mechanical hardness.

With the above summarized thoughts in mind, the very pertinent question arises as to the extent to which the different methods of hardness testing agree for various individuals and also for various machines of otherwise identical make or design. Progress in the construction of testing equipment meant ultimately a reasonably complete eradication of serious deficiencies in the experimental error due to inaccuracies in handling, reading, etc. The latter factors are of greater significance in attaining desirable and duplicatable precision when examining hardness characteristics of metals than many other technicalities. Consequently, this attitude was considered as main criterion in the divergencies of many conversion diagrams and tabulations, for which reason all possible care has been exercised in the present study to

And Alloy Steels

By JOHN H. HRUSKA
Metallurgical Engineer, Berwyn, Ill.

use only carefully calibrated apparatus under such conditions which would enable the preparation of a generally useful conversion table.

Whenever published values of other investigators were taken into consideration in this work, comparative tests were made to ascertain the reliability of the respective sources. It is perhaps needless to state that thousands of tests and calculations were essential in computing the figures given in Table II. In the preliminary compilations of data, stress was laid on the practical applicability of the methods of testing finally accepted for further exploration. The methods thus selected represent the most commonly used procedures of static, dynamic and scratch hardness testing.

The first, i. e., static or indentation test, included the methods of Vickers (diamond pyramid), Brinell (steel and tungsten carbide ball), Rockwell (diamond cone and steel ball), AlphaDurometer (diamond cone), and Monotron (diamond ball). Dynamic or kinetic testing methods comprised the drop hardness test (steel ball), the Herbert Pendulum, the Shore scleroscope and the Duroskop. Of the scratch methods, only the standard Moh scale was considered because of the limited importance of all other methods in hardness testing of metals. Detailed explanatory notes on the observations made during this study are given in the subsequent paragraphs.

Comparative Study Made

A scrutiny of results obtained from the practical applications of various methods and instruments of hardness testing shows that the machine by Vickers is probably the least affected by the previously

(CONTINUED ON PAGE 90)

TABLE II—CONVERSION TABLE OF VARIOUS HARDNESS NUMERALS

This table applies only to chemically and mechanically uniform steels containing carbon, chromium, nickel, vanadium, molybdenum, silicon and manganese, none of the alloys exceeding 4 per cent. No cold-worked steels are included. All testing methods used were those recommended by the manufacturers of the respective instruments.

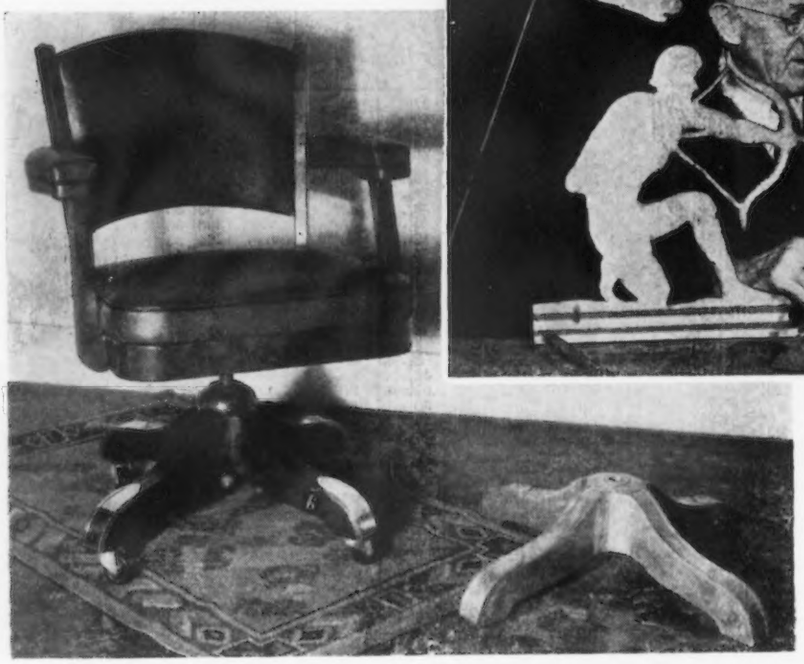
Vickers or Firth	Brinell			Rockwell							Durometer	Monotron		Drop Hardness mm. kg.	Herbert Pendulum		Scleroscope	Duroskope	Moh
	Diameter mm.	Standard Ball	Tungsten Carbide Ball	C 150 kg.	D 100 kg.	A 60 kg.	B ⅛-in. Ball	E ⅛-in. Ball	30-N	30-T		Cons. Dia.	Diam. Brin.		Time S	Time D			
1224	2.20	780	872	72	78	84	.	.	87	.	28	130	1200	. . .	90	64	106	. .	
1116	2.25	745	840	70	77	83	.	.	86	.	31	122	1130	. . .	85	59	102	. .	8.5
1022	2.30	712	812	68	75	82	.	.	84	.	32	111	1030	. . .	80	56	98	. .	
941	2.35	682	794	66	74	81	.	.	83	.	34	103	956	. . .	76	52	94	.	
868	2.40	653	760	64	72	80	.	.	81	.	37	96	894	. . .	72	49	91	54	
804	2.45	627	724	62	71	79	.	.	79	.	40	91	850	. . .	67	47	87	53	8.0
746	2.50	601	682	60	70	78	.	.	78	.	43	86	804	. . .	63	45	84	52	
694	2.55	578	646	58	68	78	.	.	76	.	45	82	767	1400	60	42	81	51	
650	2.60	555	614	56	67	77	.	.	74	.	46	78	727	1300	56	40	78	50	7.5
606	2.65	534	578	54	65	76	.	.	72	.	48	74	690	1225	53	38	76	49	
587	2.70	514	555	52	64	75	.	.	70	.	49	71	660	1160	51	37	73	49	
551	2.75	495	525	50	63	74	.	.	69	.	50	68	630	1095	48	36	71	48	
534	2.80	477	514	49	62	74	.	.	68	.	51	66	610	1050	47	35	68	48	
502	2.85	461	477	48	61	73	.	.	67	.	52	63	586	1005	44	34	66	47	
474	2.90	444	460	46	60	73	.	.	66	.	53	61	566	950	41	33	64	46	7.0
460	2.95	429	432	45	59	72	.	.	65	.	55	59	548	910	39	32	62	46	
435	3.00	415	418	43	58	72	.	.	64	.	56	57	530	880	37	30	61	45	
423	3.05	401	401	42	57	71	.	.	63	.	58	55	510	840	35	29	59	45	
401	3.10	388	388	41	56	71	.	.	62	.	59	53	490	810	34	28	57	44	
390	3.15	375	375	40	56	70	.	.	61	.	60	51	471	780	33	27	56	44	6.5
380	3.20	363	364	39	55	70	.	.	60	.	62	50	462	750	32	26	54	43	
361	3.25	352	352	38	54	69	.	.	59	.	63	48	453	725	30	26	53	43	
344	3.30	341	341	36	53	68	.	.	58	.	64	47	433	700	29	25	51	42	
334	3.35	331	330	35	52	67	.	.	57	.	65	45	414	675	28	24	50	42	
320	3.40	321	321	33	50	67	.	.	56	.	66	44	408	650	27	24	49	41	
311	3.45	311	311	32	50	66	.	.	55	.	68	42	390	630	26	23	47	41	
303	3.50	302	302	31	49	66	.	.	54	.	69	41	380	610	24	23	46	40	6.0
292	3.55	293		30	48	65	.	.	53	.	70	40	370	590	24	22	45	40	
285	3.60	285		29	47	65	.	.	52	.	71	39	360	570	23	22	44	40	
278	3.65	277		28	47	64	.	.	51	.	72	38	350	550	23	21	43	39	
270	3.70	269		27	46	64	.	.	50	.	73	37	340	535	22	21	42	39	
261	3.75	262		26	45	63	.	.	49	.	75	36	331	520	22	20	41	38	
255	3.80	255		25	45	63	.	.	48	.	76	35	322	505	21	20	40	38	
249	3.85	248		24	44	62	.	.	47	.	77	34	313	490	21	19	39	37	5.5
240	3.90	241		23	43	62	102	.	46	85	78	33	304	475	20	19	38	37	
235	3.95	235		21	42	61	101	.	45	84	79	32	295	460	20	19	37	37	
228	4.00	229		20	41	61	100	.	44	83	81	31	286	450	19	18	36	36	
222	4.05	223		19	40	60	99	.	43	82	82	30	277	440	19	18	35	36	
217	4.10	217		17	39	60	98	110	42	82	83	29	268	430	19	18	34	36	
213	4.15	212		15	38	59	97	110	40	81	84	29	268	415	18	17	34	35	
208	4.20	207		14	37	59	95	110	39	81	86	28	259	405	18	17	33	35	
201	4.25	201		13	37	58	94	109	38	80	87	28	259	395	18	17	32	35	
197	4.30	197		12	36	58	93	109	37	79	88	27	250	385	17	16	31	34	
192	4.35	192		11	35	57	92	108	36	78	89	26	. . .	375	17	16	30	34	5.0
186	4.40	187		9	34	57	91	108	35	78	90	26	. . .	365	17	16	30	34	
183	4.45	183		8	34	56	90	108	34	77	92	25	. . .	360	17	16	29	33	
178	4.50	179		7	33	56	90	107	33	77	93	25	. . .	350	17	16	29	33	
174	4.55	174		6	33	55	89	107	32	76	94	24	. . .	340	16	15	28	33	
171	4.60	170		4	32	55	88	106	31	76	95	23	. . .	335	16	15	28	32	
166	4.65	167		3	32	54	87	106	30	75	96	23	. . .	330	16	15	27	32	
162	4.70	163		2	31	53	86	105	29	74	97	22	. . .	320	16	15	27	32	
159	4.75	159		1	31	53	85	105	28	73	99	22	. . .	315	16	15	26	31	
155	4.80	156		0	30	52	84	104	27	73	100	21	. . .	310	16	15	26	31	
152	4.85	152		.	.	.	83	104	.	72	102	21	. . .	300	16	15	25	31	
149	4.90	149		.	.	.	82	103	.	71	104	20	. . .	295	15	14	24	30	4.5
146	4.95	146		.	.	.	81	103	.	71	105	20	. . .	290	15	14	24	30	
143	5.00	143		.	.	.	80	102	.	70	106	19	. . .	285	15	14	24	30	
140	5.05	140		.	.	.	79	102	.	69	108	19	. . .	280	15	14	23	29	
138	5.10	137		.	.	.	78	101	.	68	109	19	. . .	275	15	14	23	. .	
134	5.15	134		.	.	.	77	101	.	68	111	18	. . .	270	15	14	23	. .	
131	5.20	131		.	.	.	76	100	.	67	113	18	. . .	265	14	13	22	. .	
129	5.25	128		.	.	.	75	100	.	67	115	18	. . .	260	14	13	22	. .	
127	5.30	126		.	.	.	74	99	.	66	116	17	. . .	255	14	13	22	. .	
123	5.35	123		.	.	.	73	99	.	66	117	17	. . .	250	14	13	21	. .	
121	5.40	121		.	.	.	72	98	.	65	119	17	. . .	245	14	13	21	. .	
118	5.45	118		.	.	.	71	98	.	64	121	16	. . .	240	14	13	21	. .	
116	5.50	116		.	.	.	70	97	.	63	122	16	. . .	235	.	.	20	. .	
115	5.55	114		.	.	.	68	97	.	63	123	16	. . .	233	.	.	20	. .	
113	5.60	111		.	.	.	67	96	.	62	124	15	. . .	230	.	.	20	. .	
110	5.65	110		.	.	.	66	95	.	61	126	15	. . .	228	.	.	20	. .	
109	5.70	109		.	.	.	65	95	.	60	127	15	. . .	225	.	.	19	. .	
108	5.75	107		.	.	.	64	94	.	59	128	14	. . .	223	.	.	19	. .	

o o o

BELOW

THE "spider" base of this swivel chair is a striking example of what is being done these days with die castings.

A few years ago the large scale production of a similar base would have involved a long and labored method of manufacture. Today the whole job is done in a single operation by the Doehler process. The beautiful precision of the work is evidenced in the sharply defined surfaces of the kick plates and depressed panels on visible surfaces.

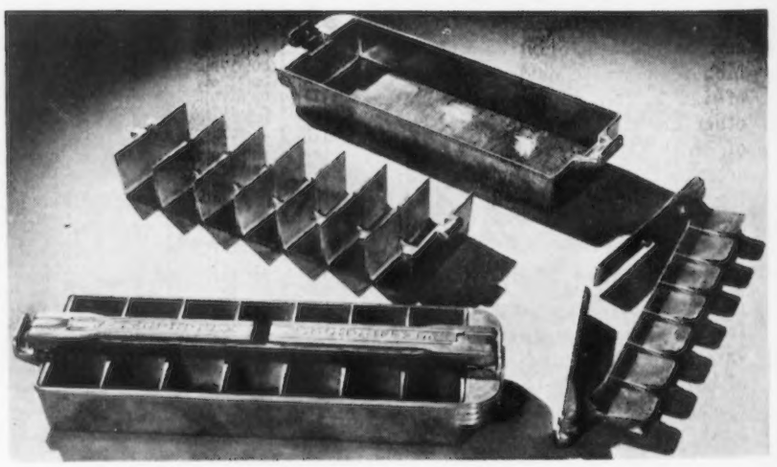


ABOVE

ISN'T he a cut up! But his customers seem to like the way that Henry Marx, of Beverly Hills, Cal., turns sheet metal into unique and attractive weathervanes. Work-in-process shows Pa Cupid getting somebody's goat.

THE Doehler Die Casting Co. has solved is not taken seriously, at least in easily and quickly from refrigerator trays. The "Eject-O-Cube" ice tray eliminates the old "hot water" treatment, and the equally messy "force" treatment. This tray is featured on all models of the Westinghouse refrigerator.

The principle embodied for the removal of the cubes is a simple cam action. By merely lifting the handles bearing the trade name "Westinghouse," as seen in the photograph, the user loosens all the cubes in the tray. By continuing to swing the handles back in an arc, the cubes are raised clear of the tray wall. The center division is a tapered die cast core operated up or down by the cam action. Being tapered widest at the bottom, the cubes are literally forced upward with this center division operated by the handles.



AT RIGHT

A DIESEL power plant is a part of the sandblasting unit here shown preparing the ship Lebec at Terminal Island, Cal., for the reconditioning of her decks, hull and super-structure. Old paint and all traces of rust are removed before the repainting is completed.

AT LEFT

VIBRATION of turbine blades is studied by means of this ingenious 500-watt electromagnetic vibrator in the laboratories of the Westinghouse Electric & Mfg. company's South Philadelphia works. Frequencies from 30 to 10,000 cycles per sec. can be produced. Amplitudes and frequencies are measured and each specimen is vibrated at constant amplitude until a crack occurs, from which can be calculated the endurance limit.

AT RIGHT

THIS giant drag-line bucket has the job of chewing away some 40,000,000 cubic yards of earth in the construction of the All-American Canal, 75-mile federal irrigation project, in Southern California. Its "bite" is 12 cu. yd. Occasionally it must pause for dental attention, when "filling" is applied by the electric arc welding process.

Photo Courtesy Lincoln Electric Co., Cleveland

Innovations in Open-Hearth

SOME prophets have judged the open-hearth an obsolete and inefficient instrument for melting and refining steel. Nevertheless, this unique batch making device has consistently fulfilled all the demands of the rolling departments. The modern open-hearth product is comparatively cheap, the analysis may be manipulated quickly and accurately, and high-grade steel having definite desired characteristics may be tapped despite the variety of materials, both good and bad, delivered to the charging platform. These attributes have not as yet been duplicated by equipment of radically different design. Thus it is safe to assume that the open-hearth for many years will continue the primary and most important unit in America's steel industry.

The rapid improvements in open-hearth efficiency in the past decade are traceable in part to the lively debate, friendly cooperation, and liberal swapping of information each year by superintendents attending the meetings of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers. In these meetings was spread the gospel of sealing furnaces from end to end; of widening and lengthening hearths; of adopting new checker designs; of introducing automatic controls and of modernizing or eliminating entirely troublesome and costly valves.

April 11 and 12 were the two days devoted to the 1935 open-hearth conference, and more than 230 superintendents reported at the Netherland Plaza Hotel, Cincinnati, to present and argue their mutual problems. Following a few timely introductory remarks by Chairman Leo F. Reinartz, an extensive resume of ladle and teeming practice was given by G. D. Tranter. Although Mr. Tranter made no attempt to present cure-alls for the many problems of pit operations, his remarks were illuminating on the excellent practices in manufacturing its low-carbon of the American Rolling Mill Co. (under 0.1) rimming steels for sheet purposes.

Mr. Tranter stated that the factors affecting the origin of defects in ladle and teeming practice may be summarized as follows:

(1) Running stoppers resulting from mechanical failure of the stopper rod, stopper head, nozzle, or manipulating mechanism.

(2) Failure to properly clean ladles and molds between pourings, poor lining practice, failure of the refractories, and too rapid pouring speeds.

(3) Improper technique and manipulation in teeming the metal from the ladle into the molds.

(4) Mold design, temperature of molds at time of teeming, cleaning and conditioning molds, type and methods of applying mold coatings.

(5) Capping ingots, elapsed time for pulling, stripping and charging ingots into the soaking pits.

Enlarging on these five factors, Mr. Tranter was of the opinion that mechanical failure of the stopper rod and operating mechanism is the most common cause of running stoppers. Difficulties can usually be traced to faulty stopper heads, sleeve brick, assembly of the rod or insufficient drying of the rod before use.

Ladle brick should be sufficiently dense to prevent excessive slag penetration and should have the proper constituents to resist the fusing action of slag and metal. Tight joints in the lining are obviously essential, taking into account the necessary allowance for expansion. By using the proper proportion of brick shapes—arch, wedge, and squares—more uniform lining practice is obtained.

Stopper rod assembly should be assigned to a regular stopper rod maker inasmuch as the workmanship is of a specialized nature. The graphite stopper head is affixed to the lower end of the stopper rod by means of a bolt and key or, in some plants, a screw type head is used. In fitting the key type head to the rod, it should turn freely but not loosely, in order that subsequent expansion may not cause splitting. On the other hand, loose heads may burn off due to molten steel penetrating the joint. A tapered bottom sleeve into which the shank of the stopper head is fitted serves as an added protection at this point. The bolt hole in the stopper head is plugged with a moist compound usually obtained from the stopper-head manufacturer. Home-made compounds are none too reliable.

Fire clay used to pack the joints between the sleeve brick should be of flint base clay of good quality. A drying oven is necessary, and a vertical type is particularly satisfactory. The ideal arrangement is to have the new rods enter one end and the dry rods emerge from the other. The furnace should be equipped with a recording pyrometer and a definite drying cycle followed. An oven having four compartments is of special advantage for taking care of rods of different sizes. After removal from the furnace, the rods should always be held in the vertical position to avoid cracking in the joints.

Welded Ladle 25 Per Cent Lighter

Mr. Tranter was of the opinion that nozzle setting is of extreme importance. Grinding the nozzle cup has given satisfactory results where a slight imperfection prevented a proper fit with the stopper head. Care must be taken to avoid grinding the surface too deeply. Otherwise the soft interior, beyond which the surface firing has toughened the brick, will be exposed. Nozzle size is a subject of considerable debate. The larger nozzle is more favorable to ingot surface but has a detrimental effect on the interior structure from the standpoint of blow holes, pipe and inclusions. Oval-shaped nozzles have come into more general use and have special advantages where slab-shaped ingots are poured, as the metal stream has less tendency to strike the mold wall on the narrow dimension.

Technique

Sharp Debates on Year's Developments Feature Annual Convention of Superintendents

Length of nozzle is also a factor, and the trend has been toward longer nozzles. A number of plants are now using nozzles 12 in. or more in length. The longer length greatly reduces the spraying of the metal stream.

Many steel men continue to experiment with ladle design in order to arrive at the proper ratio of height to diameter. Oval ladles have been a solution where increased depth would be detrimental to quality or where clearance and limitations of certain existing equipment would be a problem.

Welded ladles have made it possible to increase the size of heats in plants where building columns, crane runways and ladle cranes are of insufficient capacity to carry heavier weights. The welded ladle is approximately 25 per cent lighter than other types of the same capacity.

The problem of insulating ladles has been satisfactorily solved, resulting in lower radiation loss through the shell of the ladle. The insulation consists of approximately 1 to 1½ in. of insulating cement applied with a trowel to the inside of the shell. This practice had for its original objective the use of a thinner lining, thereby increasing the capacity of the ladle. The calculated radiation loss of the thinner lining without insulation material was given a trial and, after considerable experimenation, a satisfactory insulating cement was found which served the purpose very well. While no actual heat conductivity calculations have been made, the outside of the ladle indicates only a slight increase in temperature to the touch. Thus the thinner lining has been entirely satisfactory, and no decrease in service life has been noted.

Greater importance, continued Mr. Tranter, is being attached to mold cleaning practice and its effects on quality and mold life. Inclusions, surface defects and mold stickers result from poorly cleaned molds. In many cases a haphazard cleaning job results where the mold yard gang are required to stand on top of the mold to perform the operation—the amount of cleaning in this case being more or less in proportion to the temperature of the drag. This practice is also a serious safety hazard.

A better job of cleaning, with no time loss, is done where a movable platform operating over the train of molds provides a safe and effective means for cleaning. This arrangement calls for fewer men, and safety hazards are practically eliminated.

Concerning the capping of ingots and pulling heats, Mr. Tranter pointed out the beneficial effects resulting from removing the slag or scum which is formed during the effervescing action in the molds before placing the cap on the ingot. This scum can be blown off with compressed air or scraped off with a wood pole or paddle. This practice serves to prevent ingots from "blowing up" or spouting, a quality and safety

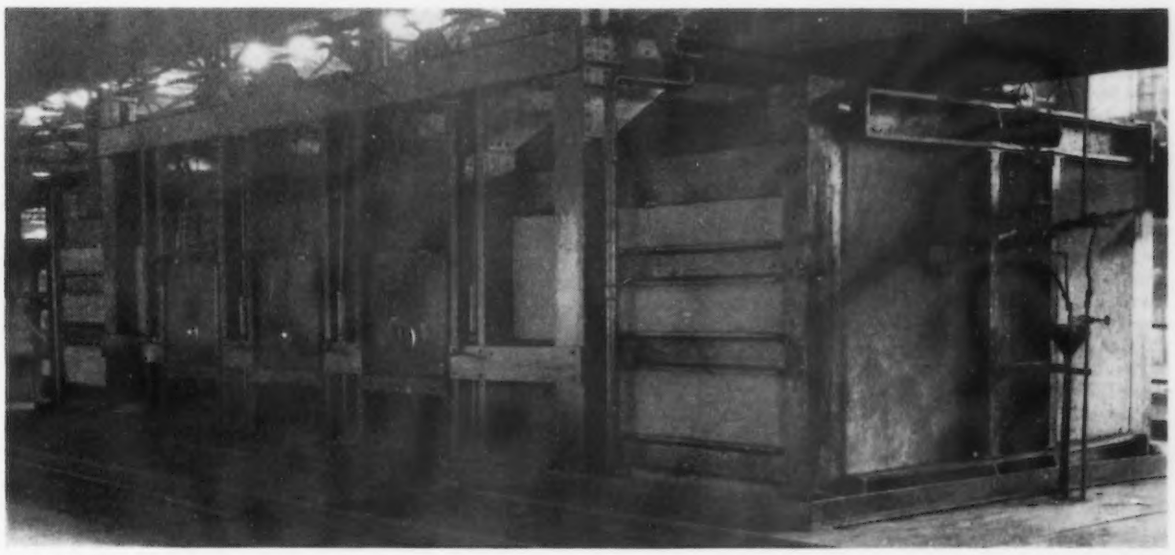


FIG. 1—Many open-hearth operators are using Therm-O-Flake insulation. This view shows the neat appearance of walls coated with about 2½ in. of plastic. Adhesion is attained by big-headed nails driven into the wall or by the use of chicken wire.

hazard which otherwise frequently occurs where large slab ingots are poured.

Pulling heats too quickly after teeming has been found to have considerable bearing on the formation of interor defects. Repeated experiments have demonstrated that certain types of laminations result from moving the ingot too quickly after pouring, and charging into the soaking pit too rapidly.

Following Mr. Tranter's address, the question was asked as to the best method of inspecting ladle trunnions for defects and flaws which develop frequently as the result of overflowing slag. It was the opinion of several operators that a thorough washing with kerosene was the simplest and best method for disclosing these inherent cracks.

The attention of the convention was next directed to the experiments being conducted on basic linings for ladles. During the past few years there has been a great improvement in steel quality due to the reduction of non-metallic inclusions as a result of changes in furnace practice. Therefore, it has seemed that further progress would be made if the pickup of non-metallic impurities from ladle linings could also be reduced.

Tapping a basic steel and a basic slag into an acid-lined ladle does not appear to be metallurgically sound. Several years ago, according to one operator, fairly extensive tests on basic linings were carried out in one plant. Anticipated improvements in steel quality resulted, but serious mechanical difficulties were encountered.

Electric furnace operators, particularly those pouring high-manganese steel such as Hadfield's steel of 12 to 14 per cent manganese, impose very severe conditions when pouring on acid ladle linings. The work with basic linings was, therefore, extended in this industry, and a plastic basic wash was finally secured which gave marked improvement. With this progress in the electric furnace field as a background, the Canadian Refractories Limited initiated tests on its 695 plastic cement for ladle linings. Results of the use of this basic lining are reported as being excellent, and for about a year now several steel producers have employed this practice continuously. The gain has been twofold. Non-metallic impurities have been largely eliminated and the ladle lining life has been increased some five times.

Basic Ladle Mixture Seems Likely

This 695 cement is marketed in dry form with necessary bonds. It is tempered with water to a definite consistency and rammed behind a form directly against the ladle shell. After slow drying to drive out all moisture, the lining is ready for service.

One user of this mixture objected to the policy of ramming directly against the shell inasmuch as the product has fairly high conductivity and the shell may be injured for that reason. Thus it was suggested that a 1-in. insulation should first be applied to the ladle shell.

Another operator described results of a number of heats of rail steel wherein a basic lining was experimented with in an attempt to avoid a reversion of phosphorus and a loss of manganese. Four ladles were lined with a 20 per cent Portland cement mixed with magnefrit, applied 2½ in. thick over a brick lining. Each ladle made five or six heats after which a skull formed on the bottom. In removing this skull the lining was damaged and had to be renewed.

The result of this experiment on basic ladle lining is best expressed by means of slag tests. Such a test taken before tapping contained 16.50 SiO_2 and 0.910 phosphorus. A slag test taken from the ladle after the heat was poured contained 21.50 SiO_2 and the phosphorus was unchanged. Using a conventional brick-lined ladle, a slag test before tapping indicated 16.50 SiO_2 and 0.930 phosphorus; a slag test from the ladle after the heat was poured showed 30.50 SiO_2 and 0.670 phosphorus. The operator making these experiments was of the opinion that a basic lining had a definite future, but that present mechanical difficulties would indicate that a fully successful lining will probably not be all basic but will be some optimum mixture.

The next subject discussed was the importance of constant maintenance of tap hole in order to secure good steel. One operator reported the use of Canadian Refractories' 695 cement for making tap holes, and through its use the hole life was sometimes increased 100 per cent but more often about 75 per cent.

C. R. Fondersmith, of American Rolling Mill Co., reported quite explicitly as to that company's procedure for maintaining tap holes. A 6-in. pipe is used in the hole when the diameter grows to 8 in. When it is less than 8 in. and more than 6 in. the hole is patched with ground chrome ore to 6 in. in diameter. The second helper goes to work on the tap hole immediately after the heat is tapped. After pulling the runner all the steel is drained out of the tap hole, after which the hole is dried up with dolomite, worked with bar and raked out. The hole is then checked for size, elevation and alinement.

If it is not over 2 in. too low, it is filled up with chrome ore; if over 2 in. low, it must be bricked up. If the hole is large enough to need piping, the pipe is placed at this time. Chrome ore is thrown in around the front of the pipe, but care is taken to rake out all the ore from in front of the hole. Backfill around the pipe is accomplished with chrome ore shut up with dolomite and faced with dolomite and burned refractory. A 4-in. plug of loam is used. Armco averages about five heats to each pipe, although occasionally a pipe will last 10 to 12 heats.

Any large variation in size of the tap hole will interfere with the uniformity of ladle additions on successive heats, and it has been found very important to make ladle additions consistent as to time in the ladle and the time the slag starts into the ladle. Also a large tap hole tends toward excessive mixing of slag and steel, which is not conducive to quality. Teeming temperatures are also affected by the size of tap hole.

The discussion on the use of two nozzles was brief, inasmuch as this practice is still in limited use. F. B. McKune, of Steel Co. of Canada, continues to use two nozzles extensively and continues to be very enthusiastic as to their worth. An American operator described his two-nozzle elliptical ladle. Its use resulted in better surface and quality of ingots and, of course, less temperature variation. This operator believed double nozzles of considerable advantage and expressed his determination to so equip all his ladles. It was also reported that several companies are experimenting with composite clay and graphite nozzles. No definite data are yet obtainable as to their worth or whether they consistently produce a cleaner stream of metal. No discussion was forthcoming as to advantages of basket pouring, as no one present admitted to using the method.

Lauds Big-End-Up Molds

Much of the discussion regarding mold practice centered on an address on this subject presented by Emil Gathmann of the Gathmann Engineering Co. It was stated that the salient requirements of an ingot mold for producing any type of steel are that the mold shall provide for solidification of the ingot from the bottom upward to as great a degree as practical and that the cross-

section of the mold be such that the skin of the ingot is free to contract inwardly without undue stresses, as such stresses frequently cause rupture or seams in the ingot.

As we all know, stated Mr. Gathmann, the useful life of molds, or rather the number of ingots that can be produced in the several units of a jag of molds, varies considerably. It is quite common to obtain a life of 100 ingots from some molds, while other molds in the same jag fail at 50 or less. It is believed that the primary reasons for any great irregularity in mold life, in order of their importance, are:

(1) Allowing the ingots to remain in the molds longer than is necessary.

(2) Positioning the molds too close to one another on the cars.

(3) Permitting the molds to remain in the same relative position on the cars for numerous successive heats.

Ingots should be separated from physical contact with the molds in killed hot-topped steel as soon as possible after solidification is complete, and in rimming steel as soon as the top of the ingot is welⁱ frozen over. In killed steel production, a 26-in., five-ton ingot should be allowed to remain in the mold about 4 hr. For rimming steel, it should remain from 40 min. to 1 hr., and then be immediately charged into reheating or soaking pits.

FIG. 2—Roof temperature control is almost becoming a necessity with insulated open-hearth roofs. This Thermotube installation is used by a number of operators for this purpose. A radiation pyrometer is located in this water-cooled jacket; it sights into a hollow carborundum block built into the furnace roof.

One plant has made some 50,000 tons of rimming and semi-killed steel ingots in big-end-up molds without being able to come to any conclusion regarding their advantages. The reasons for the results varying to such a great degree are worth considering.

Any big-end-up mold will not do. Rimming steel can be successfully produced in such molds only if certain definite relative dimensions, such as taper, height and cross-section, of mold are employed. The mold should be of limited height compared with its cross-section, so that the ferrostatic pressure of the molten mass will not be sufficient to deter the motion inside the lower half of the ingot shell. For the average size rolling-mill ingot, the height should not exceed about 65 to 72 in. The Gathmann company has further found that a straight or a substantially straight section in the upper portion of the mold for 15 to 25 per cent of its volume is usually necessary to produce a rim without undue rise.

It is obvious, continued Mr. Gathmann, that the bottom of the mold should be necked in so that the ingot will roll without fish-tailing. The bottom crop from blooms rolled from well designed big-end-up ingots need not exceed ½ to 1 per cent of the ingot volume. This means an increase in ingot to bloom yields of at least 3 per cent over the usual crop necessary from the bottom of big-end-down ingots.

The most important desideratum in the making of quality rimming ingots is, of course, good surface. This is assured where correct designs of big-end-up molds are employed, because there is closer and longer contact between mold and forming ingot and a relatively thick skin or shell of physically sound steel forms before the molten interior has cooled appreciably and becomes pasty. In addition, the big-end-up contour prevents any well-defined shrinkage cavity or pipe from forming in the uppor portion of the ingot.

New Mold Wash in Favor

The next subject discussed was the use of mold washes or coatings. One open-hearth superintendent reported very successful results with a product manufactured by Fitch Turco Regal Paint & Tar Co., New York, for molds used with alloy killed steels. This product is an aluminum powder or paste mixed in proportions of 1¼ lb. to 1 gal. of heat-resisting

oil. The mixture is painted or sprayed on the molds. This material, however, does not work so well with open steels, as the action cuts if off the mold.

Many operators reported continued and satisfactory use of tar as a mold wash. It was pointed out several times that molds with large corner radius should not be coated with tar as it results in corner cracks. If the corner radius is reduced the cracking is eliminated. German melters were reported to have used an asphalt lacquer in place of tar with considerable success. No operator at the meeting reported any experience with this practice.

A discussion as to the detrimental influence of large corner radius with tar coating brought out some opinions as to the value of suitably corrugated molds. It was generally stated that such molds are useful in the production of all types of ingots, as properly corrugated contours lend themselves to the shrinkage or contraction of the skin of the ingot without producing undue stresses, seams or open cracks in this initial skin.

The experiments described in last year's meeting as to the value of copper stools were greatly amplified during the year. It is generally admitted by most experimenters that, aside from increased mold life, the primary advantage of a copper stool is its ability to extract heat from the central portion of the bottom of the ingot. In analyses of split ingots made in this manner, it has been found that the steel is much denser and less segregated in its longitudinal core portion than when the plugs or stools are made of cast iron.

However, solid cast copper stools have a tendency to fire check; particularly with high-carbon steels and with steels made by the acid process. Likewise, the constant heating and cooling of the copper stools often cause cracks to form and grow across the stool. A new stool, which should greatly minimize these problems, will soon be placed on the market by Shenango Penn Mold Co. This stool is made up of copper bars held in a cast iron framework. Springs are inclosed at each end to take up expansion and contraction stresses, thereby reducing cracks arising from this source. Likewise the fire cracks are confined to each individual bar and cannot spread to adjoining bars.

One operator reported the measuring of temperatures in both copper and cast iron stools. A thermocouple placed at the center of the stools, as near the skin as possible, showed a 1500 deg. reading for an iron stool as compared with 650 deg. for the copper stool. At a point 1 ft. from where the stream of steel struck, the temperature of the iron stool was 800 deg. and the copper stool was 500 deg.

C. E. Williams, of Battelle Memorial Institute, stated that a 1.2 to 1 ratio of copper to steel ingot weight is very satisfactory. Experiments have also been conducted on a stool weighing in the proportion of 1 copper to 1.5 ingot weight, and this stool lasted for 500 heats. Although badly fire checked, the stool was restored to service by shaving an inch of copper from the top surface.

An inclusive report on recent experiments with copper stools was given by E. R. Williams of Vulcan Mold & Iron Co. His conclusions were:

(1) Dished copper inserts show economy both in reduced mold or stool cost and also in ingot cost by improving steel quality and yield.

(2) A large ratio of mass of copper to ingot is not necessary to prevent cutting or welding of the copper.

(3) Some changes in operating practice may be necessary to prevent the cutting of copper on certain grades of steel or under certain conditions.

(4) Further experiments for particular conditions will be necessary to determine the most economical weight of copper insert.

Mr. Williams specifically pointed out that the fire cracks which form in the copper should be closed at intervals by peening. Pneumatic hammers provided with a round headed tool are being successfully used, and this treatment prolongs the life of the copper materially. Also the copper should be as near 100 per cent pure as possible in order to obtain maximum conductivity. Thus electrolytic or oxygen free copper is satisfactory, whereas copper deoxidized with phosphorus usually fire cracks earlier.

Eliminates Surface Porosity

As yet no adverse effects have been reported on any tests made with copper stools or dished inserts. The following benefits have been reported:

Butt end loss of big-end-up ingots due to cracking has been reduced to nearly nothing, as compared with a loss of from 2 to 5 per cent with plug bottom molds. On big-end-down molds, the crop loss due to fins, scabs, "fish tailing," and "manufactured pipe," on rimming steel has been reduced to practically nothing, as compared with from 2 to 5 per cent loss from flat cast iron stools.

Ingot defects from splashing have been reduced by at least 50 per cent. On certain grades of electric furnace steels, the surface porosity on the butt end of the ingot has been completely eliminated. These benefits have been obtained specifically with the dished copper insert, where the dish is so shaped that the steel does not splash against the side of the mold.

The effect of copper stools on mold life is very encouraging. For molds failing by cutting at the bottom, the life has been increased from 100 to 400 per cent by permitting these molds to fail normally by fire cracking. For molds failing by fire cracking, no conclusive tests have been made. A somewhat greater amount of heat is absorbed from the ingot by copper than by a cast iron stool or the bottom of plug bottom molds; thus the mold is required to absorb less heat. It is not sufficient, however, to reduce the fire cracking of the mold materially. No great increase in mold life is expected from this standpoint.

Mr. Williams described a specific set of experiments to determine the ratio of insert copper to ingot weight with regard to the tendency of the copper to cut. Test No. 1 consisted of an ingot 14¾ by 34½ by 69, weighing 7400 lb., and an insert size of 22½ by 41½ by 10. The ratio of ingot to insert was 3.9 to 1. No cutting was apparent after 50 heats of rimming steel had been poured. The same insert was poured with all conditions the same, except silicon steel about 100 deg. colder was used. This steel cut the insert badly.

Test No. 2 used an ingot size of 14 by 16½ by 54, weighing 2990 lb., and an insert size of 18½ by 21 by 9 3/16. The ratio of ingot to insert was 4 to 1. About 100 heats of rimming steel were poured on several inserts, and no cutting resulted. The same inserts were poured with all conditions the same except 0.70 carbon steel about 100 deg. colder was used. This steel cut the insert badly 80 per cent of the time. When the nozzle was opened very slowly until the mold partly filled, there was no cutting.

Test No. 3 was the same as test No. 2, only a copper stool, 26 by 26 by 4, weighing 800 lb., having a ratio 3.5 to 1 was used. Also a copper stool, 26 by 26 by 8, weighing 1600 lb., with a ratio of 1.75 to 1 was used. The results were the same as in test No. 2. High carbon steel cut nearly every time whereas the rimming steel did not.

Test No. 4 used electric furnace

alloy steel. Ingot size was 7¼ by 7¼ by 43 and it weighed 470 lb.; the insert measured 10 7/16 by 10 7/16 by 4 and weighed 100 lb. Ratio of ingot to insert weight was 4.7 to 1. No cutting occurred. The bottom of the insert was then machined off successively 1 in. in thickness until it was only 1 in. thick, weighed 50 lb., and had a ratio of 8.9 to 1. About five ingots were poured each time an inch was cut off. There was no cutting at any time.

These tests would indicate that mass ratio of ingot to copper is not a factor in the cutting or welding of the copper. Much more experience will be needed to determine the most economical weight of the insert for the conditions involved.

Insulation Considered Necessity

As in previous meetings of the open-hearth committee, the meeting this year was characterized by lengthy discussions of methods, values, and results obtained with total or partial insulation of open-hearths. Practically every furnace man approves of the idea of insulation at the present time, not only of checkers, walls, etc., but also of roofs. It has apparently been only the lack of money that has prevented a conversion of all furnaces to a completely tight system.

Initiating the current discussion of insulation, Dr. Miller of General Refractories Co. gave a brief review of physical and chemical changes in silica roof brick in insulated and uninsulated furnaces. Dr. Miller described the changes occurring in a silica brick after it had been a furnace roof for a campaign; the portion of the refractory nearest the inside of the furnace consists of cristobalite, which is stable above 2678 deg. F. The portion of a brick near the exterior of the furnace contains quartz, and the intermediate portion of the refractory consists of tridymite. Thus there are three zones in the brick.

In an uninsulated furnace, the three zones are sharply defined. The dark colored iron silicate intermediate zone has a sharp line of demarcation from the outer zone of unchanged or only slightly changed original refractory. At the junction of these two zones there occur cracks due to the different rates of expansion and contraction of the two zones. These cracks often develop to a point where the two halves of the brick separate, and the lower portion of the brick drops into the furnace.

In an insulated furnace there is no sharp line of demarcation between the middle and outer zones. The middle zone is much broader than in the uninsulated brick and it gradually blends into the outer zone. Dr. Miller concluded by stating that silica brick in insulated furnaces has greater stability and greater resistance to disintegration and cracking during heating and cooling. Therefore, a refractory in an insulated furnace will tend to last longer than will a refractory in an uninsulated furnace.

It was stated by Mr. Buell that he had made measurements of the pickup of iron oxide by a furnace roof. This pickup amounts to about 25 lb. per sq. ft.

In describing their insulating practices, a remarkable number of furnace operators favored Therm-O-Flake plastic or granules. The only dissenting voice was that of Fondersmith of Armco who said his experience was that the material would crack and separate from furnace walls.

Nevertheless, Mr. McKune, of Steel Co. of Canada, stated that he had had Therm-O-Flake on furnaces for seven years without peeling. He uses big-headed nails driven into the wall, over which the material is applied. Another man described his practice of driving in nails over which chicken wire was stretched prior to putting on the plastic. No peeling or flaking was encountered. It was stressed that Therm-O-Flake could be reground and used time and again.

Another operator stated that insulation had cut his refractory cost in half. Using foundry practice and high furnace roof, oil consumption has been as low as 21 gal. per gross ton of metal in ladle. Much of this fuel saving, however, is attributable to the elimination of all water cooled devices; this latter factor is judged to save almost 3000 B.t.u. per hr.

The amount of Therm-O-Flake applied by various operators seems to vary considerably. Thickness and kind of brick under the insulation, of course, is a regulating factor as to insulation thickness, and also the type of steel and kind of fuel must be considered. Roof insulation varies all the way up to 4½ in., usually with about 80 per cent of granules faced with about 20 per cent of plastic material. Wall thickness is usually about 2½ in. The neat appearance of a furnace equipped with Therm-O-Flake insulation is shown in Fig. 1. One operator reported a 25 per cent saving in ferromanganese additions due to insulation. Inasmuch as less air is required in the furnace, the manganese loss is greatly reduced.

That American furnace operators are adopting insulation as fast as finances permit is demonstrated by a survey recently made by THE IRON AGE. Of furnaces canvassed, roughly 55 per cent have some form of insulation, and about 20 per cent have roof insulation. Others have plans under way for insulation.

Armco reported a study made on insulated checker chambers in order to determine the temperature difference before and after insulation. The air checker bulkhead registered 240 deg. before insulation and 185 deg. afterward; first panel 172 deg. before and 115 deg. afterward; second panel 160 deg. before and 116 deg. afterward; third panel 181 deg. before and 138 afterward. The roof measured 182 deg. before and 165 deg. afterward. The roof on this furnace was insulated with 2½ in. C_n cement covered with 2 in. of Therm-O-Flake.

Protects Roofs

The steady trend of operators toward insulated open-hearth roofs has created a definite demand for means of continuously measuring roof temperatures and some practical, continuous operating equipment for recording, signaling or controlling open-hearth roof temperatures. Even furnaces not insulated but constantly suffering with injured roofs are greatly improved by such control. One such control which has been adopted in several plants is the Thermotube unit of Leeds & Northrup Co. This device is simple, rugged and easy to install. The Thermotube, or radiation pyrometer unit, is located outside the furnace in a water-cooled jacket. Thus the measuring element does not suffer from corrosive conditions or extreme heat of the furnace. The Thermotube is placed directly above and sighted into a hollow Carborundum block built into the roof of the furnace. This block usually lasts the life of a furnace roof.

A complete Thermotube installation in a roof is shown in Fig. 2. Note the water cooling pipes leading to the jacket and how the element is located above the roof away from extreme heat and available always for inspection. This Thermotube actuates a giant recording dial, thereby permitting the constant reading of temperature from all over the charging floor. A permanent paper record of temperature is also made. The Thermotube also actuates a fuel valve. If the roof temperature reaches a danger point, the fuel is automatically cut off until the temperature drops.

With roof controls such as this, or like that of the Brown Instrument Co., dripping roofs can be avoided. The number of heats can

usually be greatly increased over that when manual control is used. And an operator can safely run the furnace right up to its highest safe temperature without constantly watching the furnace to avoid damage.

Concluding the 1935 session of open-hearth operators, several men were enthusiastic about Loftus bricks for checker work and Kromag brick for front and backwalls. A few operators who are experimenting with chrome furnace bottoms are also of the opinion that this material will become more generally used for this purpose.

The use of General Refractories' Ritex brick for bulkheads was also recommended by several operators. One installation was reported to have run satisfactory for 475 heats using oil as a fuel.

The new Ritex chrome brick is designed for all parts of basic furnaces and particularly in bridgewalls and port sections where it is particularly important to maintain the contour of the furnace for proper combustion. Many of the characteristics of Ritex bricks (either magnesite or chrome) are obtained by the process of manufacture. The makers use sized grains to obtain proper interfitting when the refractory particles are formed into brick. High forming pressures are used for molding the brick, and a bonding substance is used which enables the brick to be used without kiln firing. Ritex brick shrink about 1.02 per cent, cold crushing strength is about 8127 lb. per sq. in., deformation under static load (28 lb. per sq. in.) starts at 2860 deg., and shearing occurs at 2940 deg. This brick spalls very slightly and is impermeable to gases to a very high degree.

Trade Publications

Surface Grinder.—Pratt & Whitney Co., Hartford, Conn., Circular No. 410. Descriptive of 14-in. hydraulic vertical surface grinder. Illustrations of jobs with information as to percentage of time saving over former methods. Machine illustration with indicating arrows. Cross section illustrations detailing oil system. Coolant operation described. Specifications and equipment listings.

Ammeters.—Columbia Electric Mfg. Co., Cleveland. Six page double folder. Crompton patented "Tong Test" ammeters for measuring both a.c. and d.c. current. Picturizes use, illustrates advantages and gives comparative data.

Floor Plate.—Illinois Steel Co., Chicago. Bulletin descriptive of "Multigrip" floor plate and its advantages for specified uses. Diagrams and table of sizes given.

Electric Drill.—Chicago Pneumatic Tool Co., 6 East Forty-fourth Street, New York. Bulletin. Outlines ventilation, balance, accessibility and detailed construction of the new No. 815 portable drill having capacity up to 3/16 in.

Threading Machine.—Landis Machine Co., Waynesboro, Pa. Bulletin No. D-84. Landmaco 1¼ and 2-in. pipe and nipple threaders. Salient features, description of units and construction. Specification details.

Drill Grinder.—William Sellers & Co. Inc., Philadelphia. Folder. Illustrations and description of No. 05-D bench drill grinder and its operation in producing and maintaining the Sellers drill point on 1/16-in. to ½-in. drills.

Drilling Machines.—William Sellers & Co., Inc., Philadelphia. Bulletin, specifying common causes of high drilling costs. Illustrated examples covering (1) unequal angles and length of cutting lip, (2) incorrect clearance behind cutting edges, (3) incorrect thickness of chisel point, (4) wasteful discarding or costly reclaiming of drills, (5) improper maintenance of drills.

Surface Broaching Machines.—Foote-Burt Co., Cleveland. Circular No. 504. Details of single slide vertical hydraulic surface broaching machines No. 22 and 23. Sectional diagram showing important elements of operation. Illustrations and drawings of reverse clutch, brake shoe link, brake pedal and radius-rod foot.

Coolers, Unit.—Buffalo Forge Co., Buffalo, N. Y. Bulletin No. 2967. Illustrating and describing suspended unit coolers; floor type unit coolers; flat suspended unit coolers; floor type units with brine spray and type P.C. central station air conditioning cabinets. Charts, ratings and diagrams.

Press Brake.—Lukens Steel Co., Coatesville, Pa. Bulletin of products available from the largest machine built for bending, flanging, forming and multiple punching of both light and heavy steel plate. Description of dies and examples of products.

Fire Pumps.—Worthington Pump & Machinery Corpn., Harrison, N. J. Bulletin W-320-B 1. Worthington type LG centrifugal underwriter fire pumps. Sectional diagrams and tables of dimensions.

Pumps.—Worthington Pump & Machinery Corpn., Harrison, N. J. Bulletin W-310-B 4 A. Covers Worthington centrifugal pumps, types C, CA and CB, with charts, ratings, tables of dimensions and parts lists.

Conveyors.—Logan Co., Louisville, Ky. Bulletin No. 41. Descriptions and illustrations of conveyor details. Illustrated installations.

Sander.—Sterling Products Co., Detroit. Bulletin. Describes Sterling air-driven speed-bloc sander. Supplies general information on abrasives used.

Mallets, Mauls.—Lignum-Vitae Woodturning Co., Inc., 100 Boyd Avenue, Jersey City, N. J. Detailed price-list folder covering mallets and mauls made of lignum-vitae, hickory and dogwood for every industrial purpose.

Indicating Instruments.—Brown Instrument Co., Philadelphia. Double folder. Outlining boiler room and plant processing instruments. Illustrated installations with text giving their relations to plant operating cost.

Jacks.—Blackhawk Mfg. Co., Milwaukee. Bulletin covering component parts of a portable stand jack-unit built around a hydraulic jack having seven ton push or pull power.

Switch Boxes.—National Electric Products Corpn., Pittsburgh. Booklet. Illustrates each type of Panel box made by the company. Specifies correct connectors for completion of installations.

Conveyors.—Lamson Co., Syracuse, N. Y. Catalog. Illustrated installations of sanitary-gravity, tubular chain, live roll, boosters, belt, vertical, slant, overhead, traveyor, lowerator conveyors, and pneumatic tubes. Detail of features pertaining to the various types.

Compressors.—Sullivan Machinery Co., Chicago. Catalog. Describes plus-portable, two stage, air-cooled compressors in four sizes.

Mallets and Mauls. — Lignum - Vitae Woodturning Co., 96 Boyd Avenue, Jersey City, N. J. Bulletin giving sizes, weights and list prices of various types of mallets and mauls for sheet metal, boilershop, foundry and other industrial uses.

G. N. Harris and J. G. Green, formerly with Westinghouse Electric & Mfg. Co., and Henry Harris, formerly president, United Electric Light Co. of Wilmerding, Pa., have formed the Harris-Green Co., Farmers Bank Building, Pittsburgh, and will sell motors, control, transformers, line material, power factor corrective devices, and other similar materials, used by public utilities, industrial plants, and commercial establishments.

R. G. Moeller Co., 14415 Meyers Road, Detroit, has been appointed distributer by Link-Belt Co., Chicago, for its crawler shovels, cranes, draglines, and locomotive track-type cranes.

Late Returns from Laboratory and Mill

By T. W. LIPPERT
The Iron Age, New York

Germany Uses 12-High Mills

IN THIS country the cluster mill is not taken seriously, at least in its application to sheet steel or wide strip rolling. Americans believe a 4-high mill can duplicate any performance of a cluster mill and is, in addition, cheaper to build and easier to operate. German companies, however, are still building and operating cluster mills, particularly for rolling light gage alloy strip.

When rolling thin alloy strips it is desirable to have working rolls as small as possible to secure the optimum reduction in thickness at a given roll pressure and power consumption. The work rolls of 4-high mills, however, are limited in size by the tensile strength and the tendency to deflect in the rolling direction, particularly when the rolls have considerable barrel length.

A 6-high cluster mill prevents deflection in the vertical and horizontal directions, but this advantage is offset by several disadvantages, namely higher components of rolling pressure resulting in greater friction losses, higher initial and running costs, and greater stresses on the working rolls in cases where all rolls are not parallel.

Oddly enough, the 12-high arrangement, shown in Fig. 1, disposes of several of these disadvantages. The Rohn patents for this arrangement have been purchased by Demag Aktiengesellschaft, Duisburg, and this company has built such a mill, which is now in daily production at the plant of Heraeus Vacuumschmelze. The working rolls A have a diameter of 1.6 in., B are 3.3 in., and rolls C measure 6.7 in. The barrel length of all rolls is 11.8 in.

Razor blade steel 2.8 in. wide, with about 1.25 per cent carbon and 0.5 per cent chromium, 40 tons per sq. in. tensile strength and 20 per cent elongation was rolled down in three passes in this mill from 0.035 to 0.0095 in. without intermediate annealing. This corresponds to a reduction in thickness of 73 per cent. Manganese-silicon strip 3.2 in. wide was rolled down in five passes from 0.035 to 0.0047 in. without intermediate annealing, equivalent to a reduction of 87 per cent. This mill is expected to be particularly useful in rolling narrow alloy strips of under 0.012 in. thickness.

* * *

New Steel Strong at High Temperature

TOOLS or machine parts used in hot working of metals, i. e., matrices, pressing plungers, etc., should retain their strength when heated in use. Likewise it is de-

sirable that they should be comparatively insensitive to incorrect heat treatment. A new steel of this nature has just been patented by Fried-Krupp Aktiengesellschaft, Essen, Germany. The specifications designate an alloy which contains, in addition to iron, from 10 to 35 per cent tungsten, 0.1 to 0.4 per cent carbon, and at least one of the elements titanium, vanadium, tantalum, zirconium, uranium, hafnium, and thorium, in a total amount of not more than 10 per cent. These last-mentioned elements have a greater affinity than tungsten for carbon, and accordingly bind the carbon.

It is stated that the alloys used according to the invention may be readily forged. A typical analysis may be 0.15 per cent carbon, 0.05 silicon, 0.24 manganese, 30.6 tungsten, and 0.15 per cent vanadium. After a water quench from 1200 deg. C. this alloy Brinells 302, and on reheating to 750 deg. the hardness increases to 477 Brinell. As the carbon content of the alloys rise, more of the element or elements that bind the carbon should be added. In particular, complete combination of carbon is obtained if the vanadium percentage is six times as high as the carbon, the titanium percentage about four times, or the tantalum percentage about 6.5 times as high as the carbon. In order to develop the hardness of the alloys used according to the invention, they are preferably rapidly cooled from a temperature above 950 deg. C. and subsequently reheated to a temperature between 400 and 850 deg. C.

* * *

Specimens Mounted in Bakelite

ALMOST every day the average metallurgist finds it necessary to mount specimens for microscopic examination. In some cases it is difficult to mount samples of small wires, sheets, springs, or powders so that they will be firmly held during subsequent grinding and polishing operations.

Several research laboratories are enthusiastic about a new method of mounting samples in molded Bakelite. A small laboratory hydraulic press has been developed for this purpose; the process is simple and quick, and enables a standardized routine and uniformity in grinding and polishing operations. An example of two metal

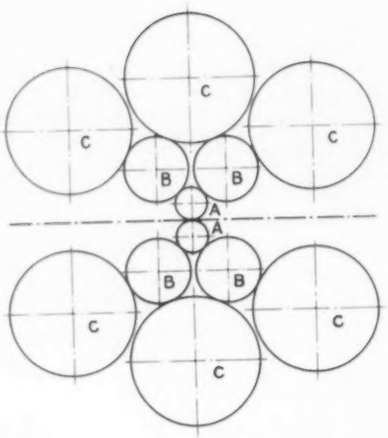


FIG. 1—Germans are still developing cluster mills. This 12-high arrangement permits of very small work rolls. Heavy reductions of high-quality steels are possible in this type of mill.

o o o

specimens so mounted is shown in Fig. 2.

This new method provides the following advantages: absolute adherence of Bakelite molded to the specimens, freedom from relief polish, margins, or crevices, uniform shape of mounting and convenience of handling, resistance to reagents, and the availability of various colors of Bakelite which permits the best contrast with specimens. In addition, the mountings will not heat up during grinding, and the material does not clog grinding wheels or emery paper.

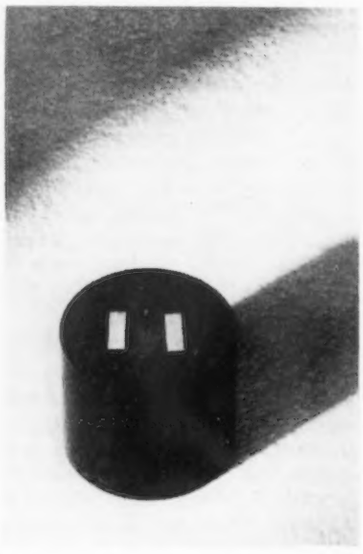


FIG. 2—A simple and cheap Bakelite molding press permits the rapid mounting of specimens like these for microscopic examination. Various colors of material may be used in order to obtain the best contrast with specimens.

Molds Sprayed With Molten Metal

A NUMBER of experiments are now under way to determine the value of spraying foundry molds with molten metal. A. Roger, of England, has described a novel and rapid method of making mold replicas. Plaster casts are made of small articles. These casts are sprayed with 0.12 in. of metal, after which the plaster pattern is removed. If the metal shells are filled with plaster they can be used with great success as patterns. The whole operation takes not more than one-half hour, as compared with a two-day procedure to make a duplicate pattern of wood.

Also, quite satisfactory results have rewarded experiments on the spraying of metals on green sand molds. It has been found of great value for use in intricate castings wherein the varying thicknesses result in cracking due to uneven contraction. A sprayed coating of nickel at places where cracks occur serves to delay cooling and even out the stresses.

In the manufacture of automobile manifolds, where a clean core is demanded, aluminum sprayed cores have been used with great success. In many cases wiring has been eliminated as the spray film gives adequate rigidity. After the casting is made a few hammer taps serve to release the core, leaving a perfectly clean hole. Great care is necessary, however, to vent the core adequately, in order that gases liberated by the sprayed metal may be released.

* * *

Segregation Causes Steel Blisters

EARLY in 1934, R. Griffiths explained the formation of blisters in the scale of heat-treated steel sheets as being due to forces set up by changes of volume during the formation of the oxide under the action of the surrounding gases.

In sharp contradiction to this theory is the data obtained by M. von Schwarz and reported recently in *Stahl und Eisen*. In his experiments Herr Schwarz heat-treated a number of thin steel sheets, and obtained one sheet which was blistered on one side, but was entirely free from defects on the other side. This sheet is shown in Fig. 3. A microphotograph of a cross section of this sheet was taken and

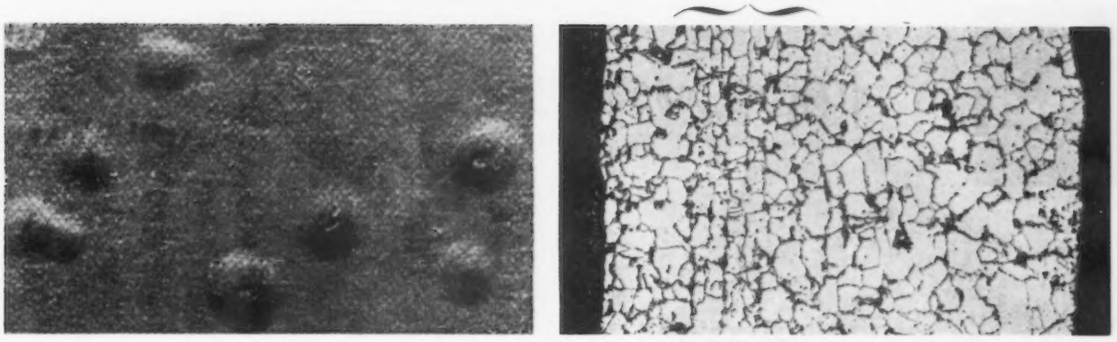


FIG. 3—Showing that the blistering of thin sheet steel (left) may be a result of the slaggy segregated ferrite band indicated by the braces on the microphotograph (right). Blistered steel photo at four diameters, and microphoto at 150 diameters.

examined (Fig. 3). The microsection reveals a phosphorus-rich ferrite band which is located nearer one surface than the other; the nearer surface was blistered and more scaled than the more distant surface, which was free from blisters. The author suggests that the blistering may be caused by outbreaks of gas which originate in the slaggy segregated ferrite band in the inadequately annealed sheet.

o o o

BELOW

THESE products of a California foundry vary from 3 oz. miniatures to 1800 lb. reproductions of old mission bells. Mrs. A. S. C. Forbes, the lady at the left, operates the bell foundry at Los Angeles, carrying on a business established by her husband 20 years ago.

o o o

o o o

ABOVE

THIS steel man seems popular with the ladies. "Alpha," mechanical robot of England, recently made a big hit at Radio City Music Hall where he acted as master of ceremonies in a new review called "Contrasts." He sings, talks and does most everything else that masters of ceremonies do.

o o o

Improvements in Production

Rapid Planetary Grooving Machines For Automotive Production

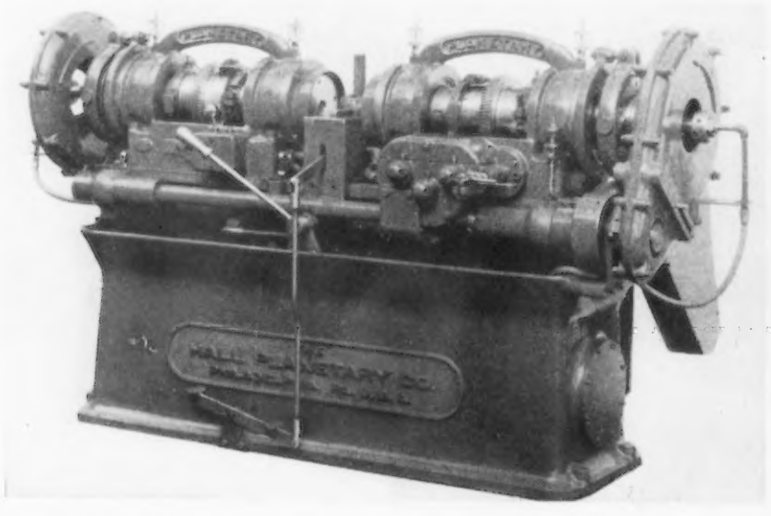
DOUBLE head planetary milling and threading machines are announced by the Hall Planetary Co., Philadelphia. One model is pictured below.

The equipment is designed for double-end threading, internal milling within holes positioned in one or more stepped-bores, and for the external milling of annular grooves, either circling or part circling.

Two head assemblies are mounted, one at each side of the vertical centerline of the bed. The eccentric bearing assemblies are each traversed toward the center to bring the cutters into the hole within the work-piece, ready for the milling operation. This method of travel is employed to assure a minimum of cutter overhang.

The position of each spindle is independently adjustable. The traverse of the two eccentric bearings assemblies is by bell cranks connected through the machine base and toggled to a hand lever operating both cutter spindles at the same time. Movement of the lever advances the cutters, starts the cutter operations and automatically releases the cutting compound.

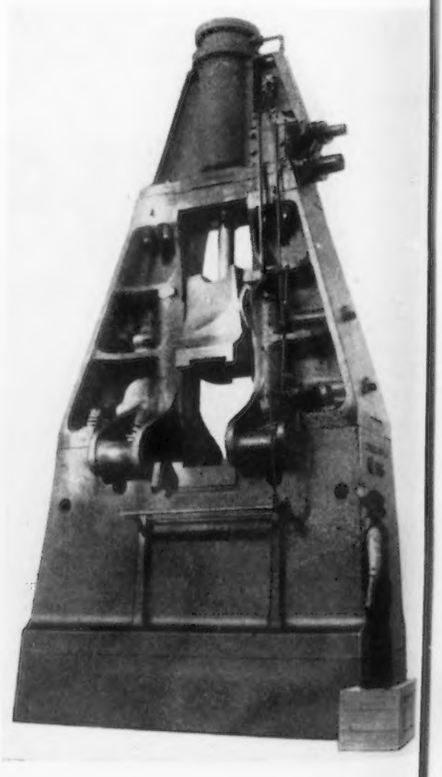
The illustration is of a machine set up for cutting two annular grooves in opposite ends of an automobile front axle kingpin hole. The axle is held in the stationary fixture by two plugs which, through a foot lever, are moved into the interrupted kingpin hole; this leaves the outer ends of the hole free for the entrance of the cutters. Movement of the spindle lever then starts the spindles through their cycle of operations at the completion of which the operator turns the axle end for for end and repeats the process. Floor to floor time for milling the two annular grooves simultaneously is given as 30 sec.



Huge Steam Hammers Installed at Buick

FOUR steam drop hammers of 12,000 lb. capacity and weighing over 400,000 lb. each are being installed at the plant of the Buick Motor Co. by the Chambersburg Engineering Co., Chambersburg, Pa. The hammer is pictured below.

In the frame, metal is massed for resistance to impact shock. The base of the frame forms guides in both sides of the thrust shoulder to prevent twisting. The ram measures 42 in. front to back. The distance between guides is 32 in. The stroke is 51 in. The cylinder is a nickel-molybdenum alloy designated as Cecolloy. A new balanced slide valve is employed. Correct speed at impact, and quick pick-up after the blow, are stressed by the maker as being design features.



and Shop Equipment . . .

Charted Roller Bearing Details For Nut and Washer Selection

TIMKEN ROLLER BEARING CO., Canton, Ohio, has prepared a series of charts for selection of lock nuts and washers to be used with the company's bearings. Full design details are given for the first two designs illustrated at right.

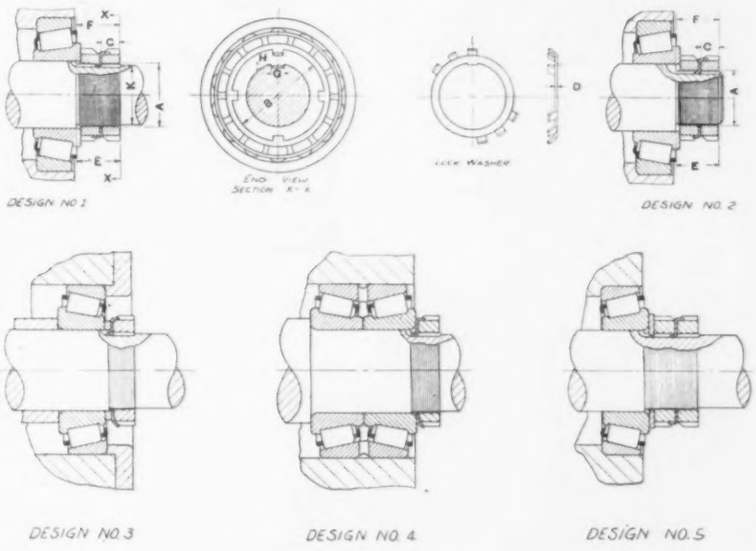
The nuts and washers listed can be used with equal success for the other three types of applications by making proper allowances. Thirty-one different sizes of lock nuts are listed, for use with 457 different Timken cones in the case of design 1, and 207 different cones in design 2.

The layout shown in design 1 is intended for cases in which it is desired to have the maximum possible shaft extension diameter. Under this heading are listed all the cones suitable for the class of application, grouped under the largest thread that can be used with them.

In the case of design 2 the bearing cone has been selected for the nut listed on the basis of proper cone backing rather than thread diameter. In this case it is often possible to use a smaller size nut than would be used in design 1, and at the same time secure the necessary cone backing. Fundamental dimensions for the nut and shaft are listed.

Design 3 covers applications where a single lock nut and tongued washer is used to clamp some other member or an assembly through the cones. In this case it is necessary to provide a small spacer between the front face of the cone and the tongued washer in order that the washer will not interfere with the bearing cage. In design 4 a single lock nut and tongued washer is shown as used in connection with an NA type bearing. In both designs the proper size nut to use may be quickly selected from the list, applying the dimensional qualifications detailed in designs 1 and 2.

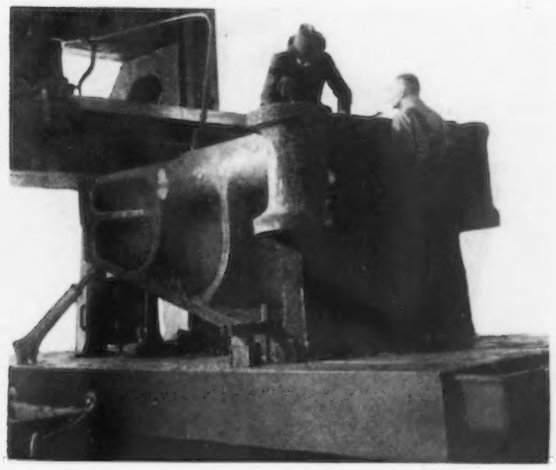
Automotive practice requires a slightly lighter fit for cones in certain applications than is called for in industrial applications. Design 5 illustrates such a case. Here a hardened tongued washer should be used between the inner nut and the cone face. The dimensions shown in designs 1 and 2 can be followed for automotive applications except that the length of the thread and keyway must be increased by an amount equal to the thickness of the hardened washer.



o o o

AT LEFT AND BELOW

DISPOSITION of mass metal for shock resistance and vibration absorption is well illustrated in this new equipment. See opposite page, column 2.

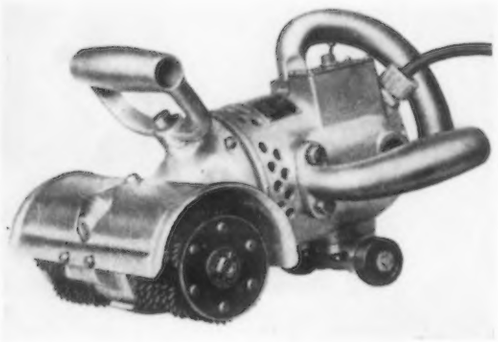


o o o

ABOVE

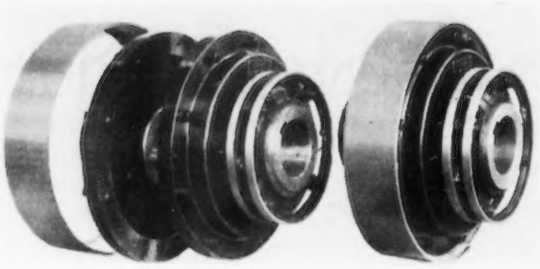
FROM these design details the user may select, from a small number of nuts and washers, the correct combination for use with a very wide variety of cones. Charted groupings permit purpose-of-use to be the deciding factor.

o o o



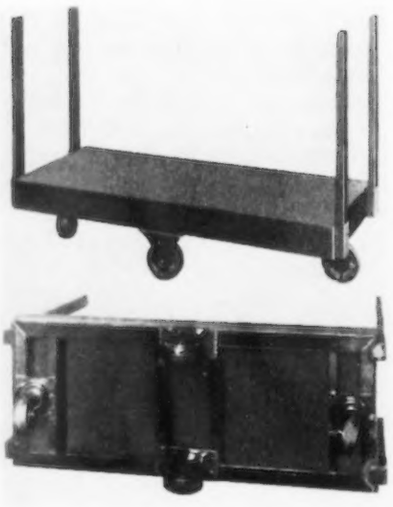
ABOVE

THIS new model, M, electrical cleaning tool is a product of the Concrete Surfacing Machinery Co., Cincinnati. It has been designed especially for cleaning steel and for use in preparation for industrial maintenance painting. Rust, scale and foreign accumulations common to metal surfaces and pitted cavities are removed to the extent required for the adhesion of the finishing material to be used. Seventy-two loose cutters, mounted into cutter bundles, provide 115,000 centrifugal-force impacts per min. The degree of impact is adjustable. Grease, seal-type, ball bearings are installed throughout. A universal motor, 1/2 hp., is used.



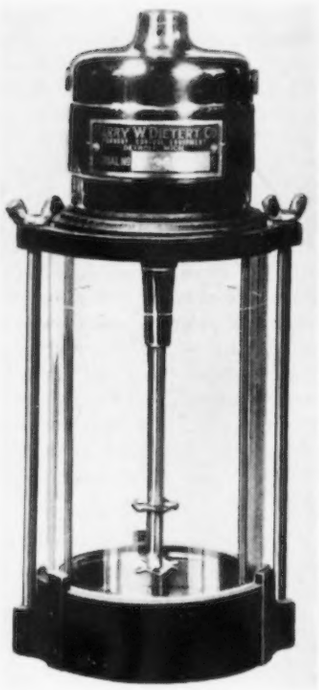
ABOVE

MAGNETIC MFG. CO., Milwaukee, announces this positive engagement clutch. The unit has teeth cut into the outer periphery through which it drives. An outer shell protects the teeth from magnetic dust and foreign matter. Engagement is effected at very slow speed or during non-rotation.



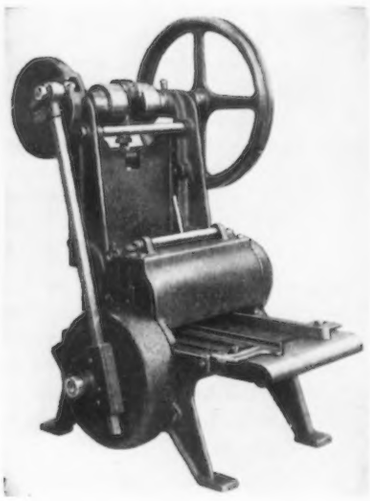
ABOVE

ELECTRIC-WELDING assembly is employed in the manufacture of this all steel platform truck. Stackbin Corpn. Providence, R. I., is the maker. The platform is heavy gage steel, formed into an inverted box section. The under-sides are inwardly formed and reinforced with 4-in. steel channel struts. Caster frames are pressed steel.



ABOVE

RAPID sand washing equipment for laboratory use in testing foundry sand is manufactured by Harry W. Dietert Co., Detroit. The clay bond is scrubbed from the grains of a molding sand during a five-minute treatment. The motor is then lifted from the wash bottle and the suspended clay bond is syphoned off, leaving the sand grains in the bottom cup. The grains, still in the cup, are then oven-dried and weighed. Clay percentage is calculated in weight difference before treating and after washing. The equipment weighs 10 lb. The power required is 1/30 hp., 110 volts.

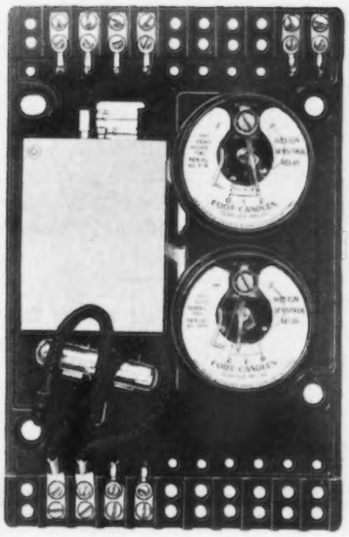


ABOVE

SMALL light dies are employed in the operation of an automatic cutting press marketed by New Art Specialties, Inc., 2626 North Racine Avenue, Chicago. The machine is for work such as contacts, clips, connectors, pins, etc. The power operated model has capacity, in light metals and insulating materials, up to 9 in. long by 5 3/4 in. wide. Wire up to 20 gage can be cut. Feed is automatic and adjustable, with locking device for production quantities use. Blades are held in a removable die-set.

AT LEFT

THIS improved fire extinguisher delivers a fan-shaped spray as well as a solid stream. The equipment is announced by Pyrene Mfg. Co., Newark, N. J. Copper and brass are used throughout. Top and bottom are fastened to an inner and an outer seamless shell, forming two chambers. The inner chamber holds compressed air while the outer contains extinguishing liquid. The inner is refilled at any air line having not less than 100 lb. pressure. Wide open, the nozzle discharges a solid stream. Partially open it produces a fan-shaped spray which vaporizes the liquid, thereby displacing oxygen and smothering fire. Capacity two quarts. Diameter 5 in. Height 18 in. Weight fully charged 16 1/2 lb.

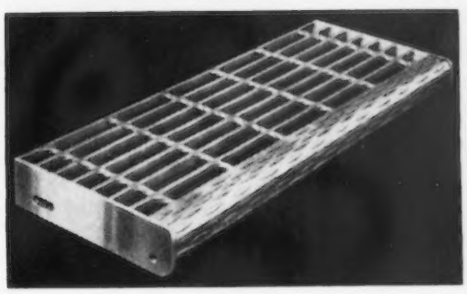


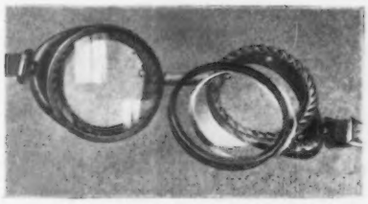
AT LEFT

PANEL control for maintenance of predetermined levels of industrial interior illumination is announced by Weston Electrical Instrument Co., Newark, N. J. Photronic electric-eye operation turns lights off and on as may be required on account of increasing or diminishing volume of light from without. Momentary shadows have no operating effect. The light collector, containing the electric-eye, is directed at the location where illumination is to be maintained; the electric impulse which it sets up is carried by ordinary leads to the panel which houses the relay and switch.

BELOW

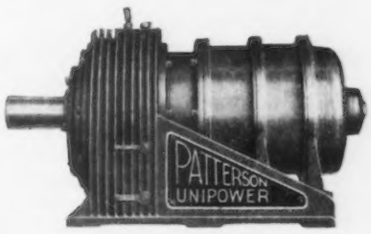
STAIR treads, as illustrated, are designed to meet requirements for strength against impact. Blaw-Knox Co., Pittsburgh, is the maker. A new abuse-resisting nosing is made from rolled diamond-checkered plate. Treads are made from electro-forged steel grating. Intersections of bars are electro-forged into one piece without cutting, slotting or punching; no metal is removed in any way. Roughened surface features the twisted cross-bar and provides safety-grip for shoe soles. The maker directs attention to abuse resisting qualities as of particular importance during building construction operations.





ABOVE

A NEW chemical-worker's goggle, produced by the American Optical Co., Southbridge, Mass., is said to have thoroughly proved its all-day-long utility for a single wearer. Ventilation, air circulation and lens shields, of types developed for the work, feature the goggle which is designated as AO-Duralite-50.

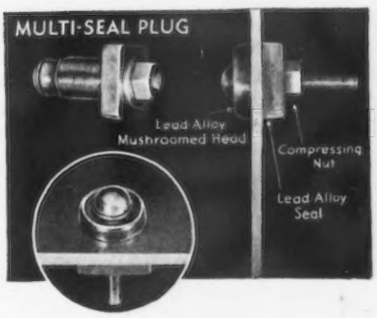


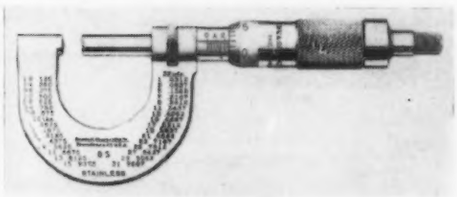
ABOVE

THE horizontal, gearless reduction drive pictured above is built by the Patterson Foundry & Machine Co., East Liverpool, Ohio. In its completely inclosed, built-in motor mounting, any standard size frame can be assembled. Power specifications are 1/4 to 100 hp., in all speeds.

AT RIGHT

FOR repairing large or small holes, plugging clean-out holes or pipe ends, remedying cracks or overlapping seams or almost any defective condition which results in leakage, a multi-seal plug has been devised by Multi-Seal Mfg. Co., 7755 Sheridan Road, Chicago.





ABOVE

BROWN & SHARPE MFG. CO., Providence, R. I., announces new micrometer calipers, Nos. 8-S and 10-S, made of materials selected for qualities of resistance to wear and strain. Threads on the measuring screw are ground in a one-piece spindle of high chromium, high-speed steel. The same material is used for the anvil. Frame, thimble, barrel and all unhardened pieces are made of stainless steel. The figures and graduations are placed upon a non-reflecting background. No. 8-S measures 0 to 1 in. by thousandths. No. 10-S measures by both thousandths and ten-thousandths from 0 to 1 in. Each is furnished with or without ratchet stop.

AT RIGHT

IMPROVED design in a hydraulic lift truck is presented by the Lyon Iron Works, Greene, N. Y. Rated capacities are 3500, 5000 and 6000 lb. A patented single frame of angle iron, arc-welded, has replaced the former channel iron and flat bar frame adding rigidity and wider surface for skid platforms. Standard lift of 3 in. is obtained in 3, 4 or 5 full strokes.

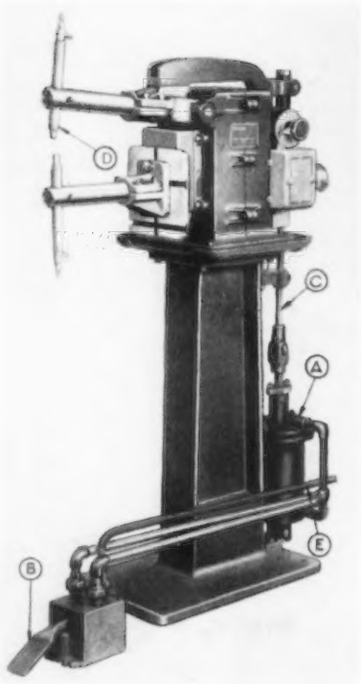
New Line of Small Electric Spot Welders

ELECTRIC spot welders which utilize air pressure for closing the electrodes upon the work are announced by the Eisler Engineering Co., 768 South Thirteenth Street, Newark, N. J.

The equipment is available in sizes from 5 to 75 k.v.a., capable of welding metals up to 0.750 in. in thickness. A model 20 k.v.a. capacity is illustrated at right. Air pressures up to 80 lb. are used; the pressure depending upon the size of welder.

In operation, the foot-controlled valve *B* admits air from the supply line *E* into the cylinder *A*. Pressure of air upon the piston within imparts motion to the electrode *D* through the vertical drive shaft *C*.

The use of air-operated welders reduces operator fatigue by supplying the force to bring the electrodes together, and, by means of a regulating valve in the supply line, permits regulation of electrode pressure upon the work.



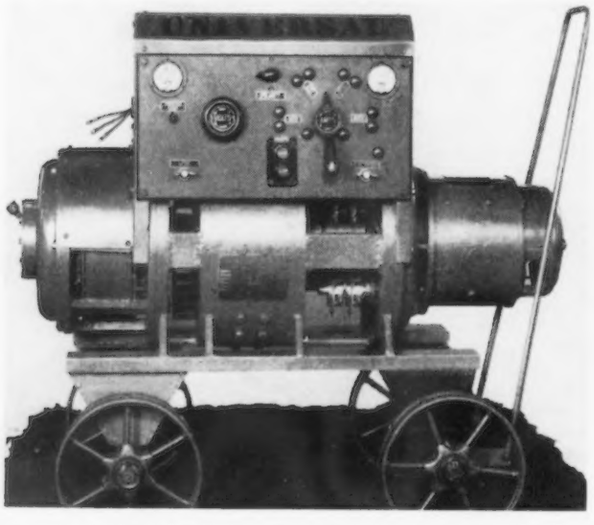
AIR pressure is employed for closing the electrodes upon the work.

o o o

Rugged Arc Welder of Motor Generator Type

A NEW arc welder of motor-generator type brought out by the Universal Power Corpn., Cleveland, is pictured below, showing rugged construction for field work. Easy control of welding current is provided in a total of about 600 current settings. The machine, it is stated, delivers its full welding range under the proposed new standards N.E.M.A. whether the welder is started cold or has been warmed up in service.

Improvements to the control panel include a rugged, easily operated current control switch with plainly labeled current settings, a voltage control dial to insure finely adjustable welding heat, ammeter and voltmeter on which polarity is plainly indicated and a polarity reversing switch. Full voltage magnetic starters with push button control, overload and under voltage features are standard equipment on 200, 300 and 400-amp. N.E.M.A. rated welders having induction driving motors.

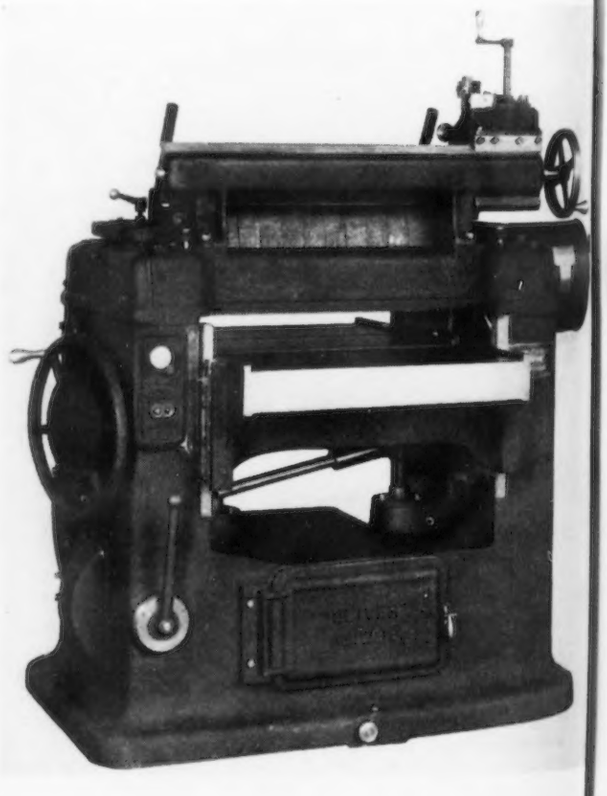


Single Surface Planer Has Unit-Mounted Rolls

THE pattern shop equipment line of the Oliver Machinery Co., Grand Rapids, Mich., has been increased by a new single surface planer, the No. 299, illustrated below. The design includes one-piece base casting, having three-point floor contact; one-piece cylinder yoke; fully inclosed ball bearing, rotating parts; centralized control, both electrical and mechanical, and unit assembly of rolls and cylinder, including bearings, for removal from the end of the machine. Maximum capacity is 24-in. wide by 8-in. thick. Pieces as short as 10½ in. can be fed through one at a time. The cylinder or cutter head is driven by a 5-hp. 2600 r.p.m. motor. The weight is approximately 3000 lb. Floor space 38 in. by 48 in.

o o o

A 4½-IN. cutting circle and inserted tungsten-chromium, high-speed steel knives are used in the cutter head or cylinder of this pattern shop planer (at right).



Activities Bearing on Machine Tools Distribution

o o o

A Department Conducted by L. M. Waite

o o o

The Cleveland Show

THE executive committee of The Associated Machine Tool Dealers will meet with the association show committee in Cleveland, April 23, for further planning in connection with its active cooperation in The National Machine Tool Builders exposition to be held in Cleveland, Sept. 11-21.

* * *

MANUFACTURERS of new and improved modern machine tools continue to announce completed or under-way betterments for improving production in metal working shops. The larger percentage of machines and equipments involved are to be shown at the Cleveland exposition Sept. 11-21. These advance announcements provide that prospective purchasers are given opportunity for advance study of equipment in order that time at Cleveland may be scheduled and devoted to the study of mechanisms having possible utility in connection with the shop or production problems of the visitor.

Automobile shows have shown a constantly increasing tendency toward development into study periods devoted to checking advertised claims and counter claims. The advantage to be gained in likewise checking machine tools, and especially in view of the great variety and range to be exhibited at Cleveland, can hardly be other than of great importance to those executives who visualize future survival of the industrially-fittest.

* * *

Sales Offices

FOR considerable time manufacturers such as Gisholt Machine Co., Kearney & Trecker Corpn., Landis Machine Co., Inc., Warner & Swasey Co., have maintained metropolitan sales offices in Newark, N. J., rather than in New York City. R. D. Heflin, representative of the Gisholt Machine Co., has his metropolitan area office in the Industrial Building in Newark. For a number of years he maintained New York City headquarters for the company. Mr. Heflin reports Newark offices decidedly preferable from viewpoints of convenience and expense. Modern highways, including the Pulaski Sky-way, provide routes which make important points more quickly accessible from Newark than from New York City, through avoidance of conjested travel. Many outlying points within New York City boroughs are more conveniently reached from Newark. Mr. Heflin stresses the point that in New York City the identity of a sales office becomes practically lost, while in Newark its existence takes on a shade of importance over a large industrial area covering 90 per cent of important contacts within a metropolitan area from Trenton, N. J., to Schenectady, N. Y.

* * *

Machinery Export

IF the activity of German manufacturers in attempting to secure American machine tools via the barter route continues its increase, there is real reason to believe that existing German restrictions as to methods of payments will of necessity be modified. Add this eventuality to the steady rise of machine tool exports into other countries during the past year and reasonable prospects of a revived foreign business would seem to be in sight.

F. W. JAEGER, 140 Liberty St., New York, long known to exporters of American machine tools, reports a steady and consistent increase in shipments and inquiries. Great Britain, Sweeden, Holland and France, since the first of the year, have been destinations for a very satisfactory volume of machine business. The larger types of standard machines have predominated.

* * *

Deliveries

"I AM recommending to my people that we place some machine tool orders at this time. Not that we are unable to get along with what we have. Not that we have a lot of money to spend. I thoroughly believe that if we wait much longer, we will pay more for machines and equipment. I am telling the folks that by 'more' I mean an amount well worth saving." This statement was recently made in conversation with a head of a large manufacturing organization, doing a wide area business and having some 60 sales agents from whom to gather facts as to trend indications.

* * *

A PROMINENT mid - western manufacturer of machine tools is setting delivery dates on standard machines at three to 12 weeks. No deliveries on machines with special features or mechanisms in less than 12 weeks.

* * *

Agencies

TERRITORIAL agents have been announced as distributers for jig boring machines manufactured by Société Genevoise d'Instruments de Physique, Geneva, Switzerland, as follows: General agents, United States and Canada, Triplex Machine Tool Corpn., 125 Barclay Street, New York. In machine tool areas, Barney Machinery Co., Pittsburgh; Blackman & Nuetzel Machinery Co., St. Louis; Joseph C. Fletcher, San Francisco; Galvin Machinery Sales, Buffalo, N. Y.; E. A. Kinsey Co., Cincinnati; Marshall & Huschart Machinery Co., Indianapolis, Ind.; Neff, Kohlbusch & Bissel, Inc., Chicago; Walter S. Ryan Co., Royal Oak, Mich.; F. W. Schiefer Machinery Co., Rochester, N. Y.; W. E. Shipley Machinery Co., Philadelphia; H. A. Smith Machinery Co., Syracuse, N. Y.; Williams & Wilson, Ltd., Montreal, Canada.

* * *

In the South

IN presenting the membership list of the Associated Machine Tool Dealers in this column of THE IRON AGE, April 4, we stated, "nor

is such a list by any means a complete tabulation of the dealers and agencies available to render something other than price-service to both purchaser and maker."

We have received a number of non-association replies endorsing the purpose of this department; among them, The Young & Vann Supply Co., Birmingham, Ala., who express appreciation of the many types of industrial service featured by THE IRON AGE. They offer wholehearted cooperation in connection with this particular department.

The executive and sales force of this dealer organization, headed by J. A. Vann, president, are well known throughout the machine tool field. They represent such manufacturers of modern machine tools as: American Tool Works Co., Gray Planer Co., Kearney & Trecker, Landis Machine Tool Co., Norton Co., Warner & Swasey, and others. Some 25 electrically controlled modern machine tools are set up in their show rooms for demonstration.

Textile, industrial and contractor's supplies and heavy hardware are warehoused by the company.

* * *

Die Castings

DIE casting plants in the automobile areas are participating in the huge demands from the automotive industry. An eastern plant reports doubled volume of business during the past 60 days with practically none of the increase from automobile shops. One manufacturer has added several high-speed machines to his production department and reports inquiries as better than in 1928. A manufacturer of die-casting machines reports a number of individual machine sales during the past 30 days and machine inquiries double those of the preceding 60 days.

* * *

Automotive

Cost reduction schedules and planned equipment replacements continue to provide activity in machine tool distribution. Reports of special purchase schedules indicate a probability of busy days ahead in a number of machine tool shops.

* * *

Reorganizations

Upper New York State reports slow orders but much inquiry activity. Plans are under way for two large plant reorganizations holding reasonable prospects for considerable machine tool purchases. Always, of course, provided the plans do not miscarry.

Steel Fabricators File Protests with Institute and Trade Commission

THE perplexing relations between steel producers and structural steel fabricators, the former operating under a code and the latter still uncodified, have come to the fore again. Citing a specific example of alleged unfair competition between mill-owned fabricators and independent fabricators, the Central Fabricators Association has called upon the Federal Trade Commission for an investigation and has filed a formal protest with the American Iron and Steel Institute, the steel code authority.

The Central Fabricators Association comprises 20 structural steel companies in Illinois, Missouri, Kansas, Nebraska, Iowa, Minnesota and Wisconsin, and has solicited the support of 60 fabricators in other sections of the country to carry on a campaign "to protect the rights of the independent fabricator."

Charge Loss of $10 a Ton

The instance cited to the commission and to the institute was the recent award of a State highway project in Illinois. Estimating material costs on the basis of iron and steel code prices and adding direct labor costs, the association arrived at a total material and direct labor cost of $68,385.92. The successful bid of the American Bridge Co. was $67,044.28, which the association states indicates a loss of $1,341.64. Adding estimated indirect labor cost, shop expense, administration expense and selling cost, together with the cost of bond, the total loss of the bidder is placed at $13,676.86, or approximately $10 a ton.

In a statement of this case forwarded to W. S. Tower, executive secretary of the American Iron and Steel Institute, the association makes the following comment:

"If this is a violation of the iron and steel code, we will expect you to take the steps necessary to prevent the continuance of such bidding. If this is not a violation of the code, the independent fabricators must, in self defense, attack the code as at present drawn, for the continuance of these conditions is rapidly moving toward the complete elimination of large numbers of independent fabricators."

The communication addressed to the Federal Trade Commission supplemented others filed with that body on Dec. 19 and Dec. 29, 1934. That of Dec. 19 asked for the separation of mill fabricators from their respective mills, and the prohibition of fabrication and erection of structural steel, either directly or indirectly, by any producer of plain material.

It was also requested that, pending the divorce of mills from their affiliates, fabrication by steel company shops for less than the established plain material price plus the cost of fabrication, erection and delivery be declared "unfair" competition in all sections of the country asking for support in a united drive for equitable competitive conditions.

Four Mill Fabricators Cited

The association's representations to the commission list the following as mill fabricators: American Bridge Co., McClintic-Marshall Corpn., and Truscon Steel Co. It is stated that the Jones & Laughlin Steel Corpn., in addition to producing plain steel, also through its fabricating department fabricates structural steel and is therefore to be considered as a mill fabricator. These interests, it is stated, produce "substantially 80 per cent of the entire output of steel and iron" and are consequently "predominantly influential members" of the code.

No code is in effect for the structural steel fabrication industry and, since mill fabricators control practically 47 per cent of the country's capacity, no code could be adopted in which the mill interests would not have a "controlling influence," it is charged.

The association states that mill fabricators take fabrication jobs at figures below cost of fabrication and are able to do so because such losses can be absorbed and balanced by profits made in the sale of plain material. This absorption is rendered possible because prices of plain material have been lifted higher, under the code, "than it is believed would otherwise exist."

The fabricators contend further that owing to the fact that only two mills roll wide flange beams those producers, in the last analysis, fix the prices of plain steel. Independent fabricators, it is stated, are dependent on these mills for "indispensable structural sections." Other mills would not hazard a price reduction on plain material "because they have no fabricating subsidiaries and can-

not risk the pressure" which mill fabricators might put upon their important customers, the independent fabricators, either by taking advantage of the mill's exclusive production of wide-flange sections or by unfair competition for structural work.

The Central Fabricators Association denounces the provision in the steel code under which steel intended for fabrication for an identified structure is priced at the place where the fabricated steel is erected.

"In substance the price is determined by adding to the base price in the district in which the place of erection is located, the freight between such basing point and the place of erection, without regard to the freight from the mill to the place of fabrication and thence to the place of erection. This system of identified structure pricing permits any fabricator to compete with fabricators outside its district and beyond its normal and proper economic territory."

Since the pricing of plain steel for an identified structure permits mills to quote a base price for a foreign district, mills are often required to absorb a substantial part of the actual freight from the mill through the place of fabrication to the place of erection, it is stated.

"The realized price to the mill thus often is materially less than the base price established for the district in which it is located."

Regulations No. 9 Condemned

Regulations No. 9 of the steel code also are condemned by the fabricators' association. Characterized as "too complicated for practical use" the regulations are also attacked as being in violation of the code. Section 1 of Article IX of the steel code expressly provides that no member shall be required to disclose the names of its customers. Regulations No. 9, in requiring identification of a particular structure, "go even further than the naming generally of the *place* where the fabricated steel is to be erected."

Regulations No. 9 are likewise held to violate Section 4 of Schedule E which stipulates that "except as otherwise provided in this Schedule E, all prices quoted and all prices billed** shall be delivered prices." The Central Fabricators Association points out that "Regulations No. 9 in essence (particularly if they be construed as requiring the fabricator in the first instance to pay freight charges) would seem to establish a pricing other than delivered prices and thus to be amendatory to Section 4 of Schedule E." An amendment to the code or any of its schedules, it is stated, can be made only upon the affirmative vote of 75 per cent of all votes which members may cast.

Indirect Violation of Code

The fabricators, moreover, contend that mills are violating the code if they sell plain steel to their fabricating subsidiaries at less than code prices.

"Under Article VII of the steel code, the members bind themselves not to make any sale at a price more favorable to the purchaser than the price, terms and conditions established by such member in accordance with the provisions of Schedule E. Schedule E in substance provides for the establishment of open prices at basing points, and it is clear that Article VII was intended to provide that no member should make sales at a price less than delivered prices based on the applicable base price. Section 10 of Schedule E provides, among other things, that the code provisions shall not apply to the sale by any code member to an affiliated company of such member of any product '** (b) for its own use (but not for use in the production, in whole or in part, of any article sold by it which is not a code product**).'

"Fabricated steel is not a code product. Sales by the mills to mill fabricators must be at code prices. But from what already has been pointed out***, the futility of the code provisions in this respect is apparent. In effect, mills having fabricator affiliates or subsidiaries are in position to sell plain steel well under the code prices to which other mill competitors having no fabricator affiliates or subsidiaries must adhere."

The average independent fabricator is not opposed to the iron and steel code, according to the Central Fabricators Association, but he believes that the code, "as it has been and is being administered, interpreted and amended, unjustifiedly and unwarrantedly favors the mill-owned fabricating shops. The independent fabricators believe that they are entitled to full consideration and a voice in the adopting of code regulations directly affecting the structural steel industry, which right and courtesy they have not been accorded to date by the iron and steel code authority."

The association also charges that mill fabricators have been able, through their competitive advantage under the code, to obtain more than their due proportion of public works tonnage.

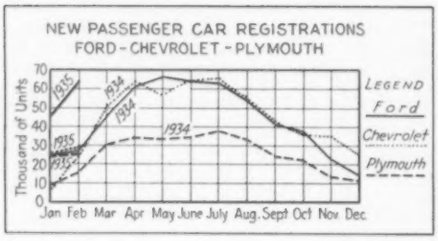
"Enormous sums have been and will be again appropriated by Congress for construction projects, primarily with the idea of relieving unemployment. Undoubtedly it is the intention of the President and of Congress that these funds be as widely and as equitably distributed as possible, and it surely cannot be their intention that in the particular matter of structural steel, mill-owned fabricating shops should be especially favored—yet a review of the contracts let during the past year shows that such mill-owned shops, or their parent rolling mills, have been so favored."

The independent fabricators go on to say that it is "manifestly unjust, and un-American as well, to permit the mill-owned fabricating shops to continue their present policy of taking contracts from 2 tons to 100,000 tons, all over the country, at prices with which the independent fabricators cannot compete, not because of superhuman intelligence, superior facilities, or lower costs, but simply because the parent company makes enough money from the sale of the raw material to allow its subsidiary to run its competition out of business."

New York Warehouse Men Name Officers

H. B. RESSLER, vice-president, Joseph T. Ryerson & Son, Inc., Jersey City, N. J., has been elected by the New York chapter of the American Steel Warehouse Association, Inc., to serve as president of the organization for the coming year. Other officers are: vice-presidents, Walter Ganong, Edgar T. Ward's Sons Co., Newark, N. J., and A. J. Bragg, Egleston Brothers & Co., Inc., Long Island City, N. Y.; secretary-treasurer, Charles Kramer, Scully Steel Products Co., Newark, N. J. Mr. Ganong also was nominated for election to the board of directors of the American Steel Warehouse Association, Inc.

In addition to the officers, the following were elected directors of the New York chapter: M. J. Faitoute, Faitoute Iron & Steel Co., chairman; A. M. Ernst, Court, Ernst & Wesson, Inc.; P. F. Benedict, Faitoute Iron & Steel Co.; Harry Edgcomb, Edgcomb Steel Corpn. of N. J.; William C. Hughes, Bright Steel Corpn.; B. F. McCreary, Carroll-McCreary Co., Inc.; T. W. Hager, Peter A. Frasse & Co., Inc.; E. H. Katz, Bayonne Steel Co., Inc.; and Lester Brion, Peter A. Frasse & Co., Inc.



THIS WEEK ON THE

April Assemblies to Be 475,000 Units; New York Show to Open Nov. 2

DETROIT, April 16.

CRITICS who predicted early this year that the sensational performance of the automobile industry wouldn't last long are having to eat their own words. The performance has not only drawn an astonishing number of cash customers, but also gives promise of continuing in full blast through the summer. Of course, hot weather and vacation days probably will slow down the tempo, but even so the box office receipts are likely to be highly satisfactory.

If automotive sales executives were reasonably convinced a week ago that the second quarter is "in the bag," they are doubly sure today. The industry hasn't radiated such confidence since 1928 and 1929. And it may be said that this isn't false optimism, but is based on daily check-ups of dealers' sales and prospects. The sales chief of one of the largest companies, who is not given to making wild predictions, privately expresses the opinion that the ratio of sales increase in the first quarter as against the same quarter of 1934 will be maintained through the third quarter.

Apparently the country doesn't need a shot in the arm to stimulate new car buying, yet the benefits accruing from the Federal Government's huge work relief program will be piled on top of the extraordinary demand already existing for automobiles. Previous Government spending programs have had the effect of expanding substantially motor car sales. Hence the air of confidence about the third quarter as well as the second quarter which pervades automotive circles.

Car Makers at Capacity

With the movement in recent years toward bigger and better cars, which means that more space is required to manufacture a car today than at any previous time in the industry's history, most car makers are operating close to their plant capacity, in view of the equipment on hand. An important company in the low-price field estimates that 500 sq. ft. of floor space per car per day is needed in its branch assembly plants, whereas a few years ago only 300 sq. ft. was necessary. It figures also that it has lost between 25 and 30 per cent of its productive capacity because of NRA's regulation of hours.

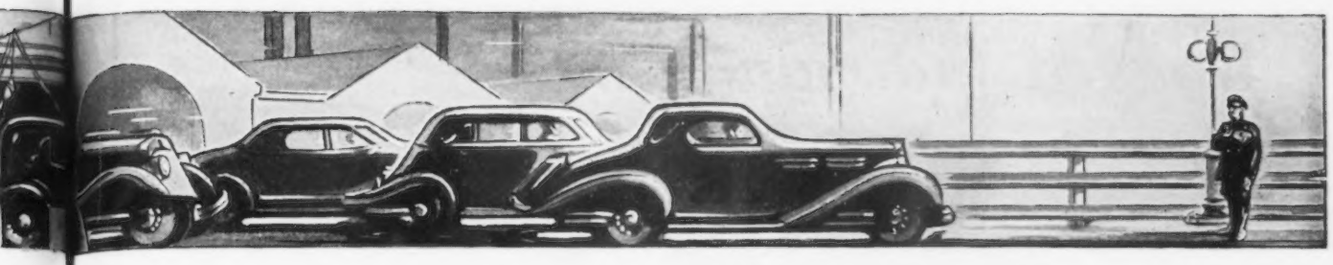
For all practical purposes, therefore, at least six car manufacturers, including the three largest units in the industry, are operating at full capacity. The laggards are the small independent companies, which are finding it increasingly tough to buck the Big Three. Car assemblies this month should run close to 475,000 units, compared with 373,108 in the same month a year ago. May's output should be well in excess of 400,000 units, unless the current trend should be unexpectedly arrested. June seems good for 325,000 units and maybe more. Second quarter production should be 1,200,000 units, as a minimum. This means that over 2,300,000 cars and trucks will be assembled in the first half of 1935. Thus this year appears likely to continue to parallel the performance in 1930. During the first six months of that year the industry turned out 2,309,335 cars.

New York Show Nov. 2

Perhaps overshadowing the industry's present prosperity as a source of interest to Detroiters the past week was the announcement that the New York automobile show will be held from Nov. 2 to 9, approximately 60 days ahead of previous shows.

The show next November will revert to a national affair with the manufacturers paying the bill and sponsoring the exhibits. It is probable that the show will be restored to its former importance, since most 1936 models will be first introduced there. The announced date gives the industry a mark to shoot at in the preparation of new models. One effect will be to insure moderate production during the final quarter of the year. Last year only 391,723 cars were built in the fourth quarter, which has been an especially weak period ever since 1929. A leading car manufacturer already has given assurance to its dealers that they will have ample stocks at show time to meet the public demand for new cars. This would appear to mean that production will be well under way in October and that initial orders for steel might come as early as August.

There has been much questioning in automotive circles of how serious the industry is in its commitment to the plan for fall introductions. It can be stated emphatically that, even with the loopholes that may exist in con-



ASSEMBLY LINE

BY BURNHAM FINNEY
Detroit Editor, The Iron Age

o o o

nection with the program, the industry intends to give fall announcements an honest, fair trial. Those who possibly have no enthusiasm for the idea will be compelled, because of the competitive situation, to go along with the industry. Ford, for example, has progressed by leaps and bounds in 1934 and 1935 because it had new models ready and put them into the hands of dealers ahead of its chief competitor. Still tasting the joys of victory as a result of this policy, Ford wouldn't be so foolish as to let other manufacturers get the jump in the 1936 sales race. Hence the industry is looking for a new Ford about Nov. 1, no matter what the Ford people think of the merits of the fall plan.

Effect on Steel Demand

Under the system of fall announcements, car manufacturers will build enough units to stock dealers comfortably and take care of the first buying spurt which immediately follows the debut of new models. As retail trade will lag during December, January and February, the industry will take advantage of the opportunity then to make motors, axles and other major parts, storing them against future assembly requirements. This program will result in considerable tonnage for steel mills in the late fall and winter; on the other hand, it probably will prevent a recurrence of the almost reckless upward surge of buying which overwhelmed the steel people last January.

Purchase by General Motors of the former Durant Motors factories in Lansing gives Oldsmobile, now at full capacity production, almost one million square feet of additional manufacturing space. Fisher Body's Lansing activities will be moved to the newly acquired plants and Olds will expand its operations, such as its motor, axle, sheet metal and final assembly departments, in the plant now occupied by Fisher. Announcement of the deal, however, doesn't mean that Olds will immediately be in the market for new equipment. It is too busy at the moment to interrupt operations by starting its expansion program. It is planned to have the additional facilities available when work is begun on the 1936 car. Purchases of machinery and other equipment, therefore, probably won't be made for 60 days. It is anticipated that the present arrangement, whereby forgings and other parts for Oldsmobile are made in the Buick factories at Flint, will be continued next year.

Ford Operations High

Ford's schedule remains at 165,000 units for April and 152,000 for May. It is operating eight out of nine open-hearth furnaces. Its steel purchases this month are not expected to be large, being confined to the evening up of unbalanced stocks. Ford hopes to put its new blooming mill into service without closing its open-hearths. At least any interruption in raw steel making will not be of more than a few days' duration.

With one of its blast furnaces being enlarged and therefore out of production, Ford has found it necessary to buy 10,000 tons of foundry iron in the open market for immediate delivery. Because it needs more passenger car frames than its frame department at Rouge can fabricate, Ford again is purchasing this item from Murray's Ecorse plant.

Chevrolet, Oldsmobile and Pontiac appear likely to continue their present capacity production through the second quarter. Chrysler Corpn. has 75,000 to 80,000 cars and trucks projected for April, with May's program yet to be determined by sales in the next few weeks. The corporation's sales have been hitting an all-time high mark at 18,000 units a week. This is a larger volume than Chrysler officials had anticipated.

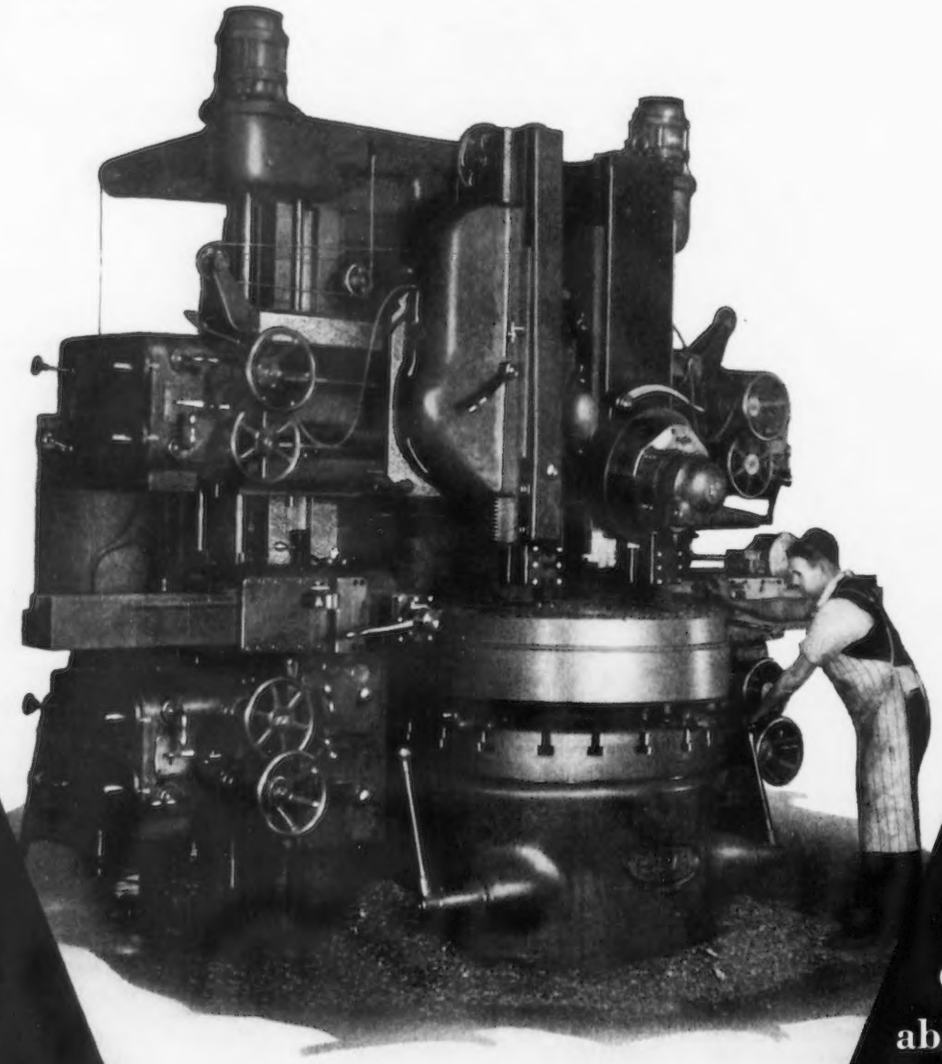
From the standpoint of production the third quarter will be the poorest quarter of the year for the industry. Looking ahead to new models in the fall, car manufacturers will take pains to see that output keeps well below retail sales, so that dealers can liquidate stocks without resort to demoralizing clearance sales. Although dealers sold 100,000 more used cars in the first quarter than in the same quarter last year, the large number of used cars piled up in dealers' lots constitute a serious menace to continued expansion of new car sales.

Hudson Gets Cash

Hudson had its financial structure bolstered the past week with $6,000,000 in cash secured through sale of notes, maturing in varying amounts from Aug. 1, 1936, to March 20, 1940, to the Federal Reserve Banks of New York and Chicago and to other financial interests. The notes, which constitute the company's only funded debt, are secured by a first mortgage on the company's manufacturing properties. Of the total amount $1,000,000 is payable in 1939 and $3,500,000 in 1940. Hudson has been operating under difficulties because of a shortage of working capital, but this transaction relieves the pressure.

The Hupp internal warfare centering around the possible ousting of Archie Andrews, chairman of the board, goes merrily on, with the matter in the hands of the Federal courts. It is understood that if peace can be restored in the Hupp household, production costs have been so cut that it would be necessary to make only 80 cars a day for the company to break even.

Rugged Individualism—



For Manufacturing Efficiency on Those Heavier Jobs INVESTIGATE the Possibilities of These Machines

HYDRO-SHIFT
Vertical Turret Lathes

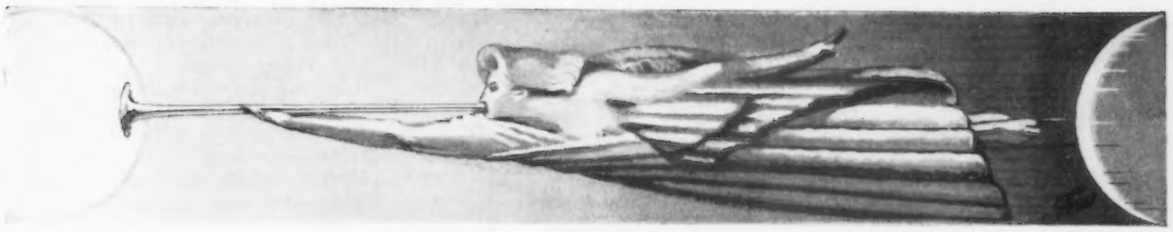
in sizes

46 inch - - - 56 inch
66 inch - 76 inch
86 inch

Obtainable in—Two, Three or Four Head Combinations. Four Head Concentration Affords a High Degree of Cost Reduction

BULLARD

Bridgeport Connecticut



NEWS OF THE WEEK

A. O. Smith to Make New Oil Well Casing

A. O. SMITH CORPN., Milwaukee, has announced that it will begin production May 1 of another new product in development for some time, namely, oil well casing of a new type. The pipe mill at present is being equipped with new machinery for manufacturing the casing in 6⅝-in. and larger sizes. The product is patented. It is cold-worked during manufacture and is said to have an exceptionally high yield point permitting its use in oil wells at much greater depths than heretofore. Due to the great strength, use of lighter pipe than formerly is also possible, according to Smith engineers.

G.E. Gets Bethlehem Strip Mill Order

INCLUDED in an order amounting to more than $1,250,000 for new electric equipment to be furnished and completely installed by the General Electric Co. at the Lackawanna plant of the Bethlehem Steel Co., are seven direct current motors totaling 22,500 hp. for driving the finishing end of Bethlehem's new continuous hot strip mill. This finishing end drive will consist of two 4500-hp. and three 3500-hp. motors, and one each of 2500-hp. and 500-hp. ratings.

In addition, the order includes two 3-unit, 6000-kw. motor-generator sets to supply power for the above motors; one 3-unit, 6000-kw. motor-generator set to supply power to the drives of two tandem cold strip mills; the most modern ventilating system yet used in a steel mill motor room; and complete switchgear and control equipment for the preceding apparatus, including 19 metal-clad oil circuit breakers each with an interrupting capacity of one-half million kilovolt-amperes.

Architectural Uses Of Nickel Alloys

NICKEL alloys in the architectural field will be dealt with in a joint paper by G. F. Geiger and R. E. Case at the annual meeting of the American Chemical Society. This paper will deal with the growing use of nickel silver, stainless steel and Monel metal in the building industry. The white metals, with finishes ranging from a rich satin to a highly-polished mirror-like surface, have been used extensively for trim during the past several years because of the varied and pleasing effects obtainable.

The meeting will be held in the Hotel Pennsylvania during the week of April 22. Both authors are members of the development and research department, The International Nickel Co., Inc.

Chateaugay Ore & Iron Co., Lyon Mountain, N. Y., is reported to be negotiating with the Davison Coke & Iron Co., Pittsburgh, for the production at the latter's Neville Island furnace of Chateaugay low phosphorus pig iron for all Western shipments.

Oglebay, Norton Take Over Lake Erie Ore And Coal Docks

THE operation and management of the ore and coal docks of the Baltimore & Ohio Railroad at Toledo and Lorain, Ohio, were taken over April 16 by Oglebay, Norton & Co., Cleveland, through a subsidiary, the Toledo, Lorain & Fairport Dock Co., which has leased these docks. The dock company is located at 1208 Hanna Building, Cleveland. The Toledo ore dock has a storage capacity of 500,000 tons and is equipped with two Hulett unloaders and the coal dock has one Wellman-Seaver-Morgan car dumper with a rated capacity of 1500 tons per hr. The ore dock at Lorain has three Brown unloaders with a capacity of 1000 tons per hr. and a storage capacity of 350,000 tons. The Lorain coal dock has a McMyler car dumper with a capacity of 2000 tons per hr. At this dock there is also equipment permitting self-unloading vessels to unload direct into railroad cars.

Oglebay, Norton & Co. have been engaged in the Lake Superior iron ore business for over 50 years. They manage several ore mining and other corporations, sell ore, coal, charcoal, pig iron and other metals and alloys and manage the Columbia Transportation Co., which operates a fleet of 17 bulk freighters on the Great Lakes. They recently took over the management of four self-unloading bulk vessels of the Valley Camp Coal Co.

Political Outlook Disturbs British Iron and Steel Demand

LONDON, April 15.—(*By Cable.*)—The market is dull and is disturbed by the political outlook, belga devaluation and uncertainty as to the forthcoming negotiations between English steelmakers and the Continental cartel.

Pig iron business is confined to small prompt parcels, although consumption is undiminished and stocks are low. No orders for semi-finished steel have been placed abroad since the duties increase, although arrangements have been made for delivery of earlier purchases.

Heavy mills are busy with good home demand for construction and railroad material and exports are improving. The first cargo of steel this year has been shipped to Australia and shipments to Argentina have been resumed, but sheet exports are disappointing.

Stewarts & Lloyds and British Mannesmann have booked a £450,000-order of tubular requirements for the Argentine Government oil fields.

The House of Commons has approved increased steel duties. United Kingdom exports of pig iron in March were 7000 tons of which 100 tons went to the United States. Total exports of iron and steel were 175,800 tons.

Tin plate inquiry is good, but business is quiet largely because of approaching holidays.

Continental iron and steel demand is fair with some Japanese and South American buying. No business is being done with United Kingdom and prospects of forthcoming meeting are not viewed optimistically. Failing to come to an agreement, recent prolongation of International Rail Makers Association and the shipplate agreement may be declared invalid in view of English duties increase.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9	
Billets, open-hearth	£5 10s.	to £5 15s.
Tin plate, per base box	*18s. 2d.	to 19s.
Steel bars, open-hearth	£7 17½s.	
Beams, open-hearth	£7 7½s.	
Channels, open-hearth	£7 12½s.	
Angles, open-hearth	£7 7½s.	
Black sheets, No. 24 gage	£9 5s.	
Galvanized sheets, No. 24 gage	£11 5s.	

*To June 1; 18s. 5d. to 19s. 3d. thereafter.

Official Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £

Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.

Billets, Thomas.	£2	7s.	
Wire rods, No. 5 B.W.G.	£4	10s.	
Steel bars, merchant	£3	5s.	
Sheet bars	£2	8s.	
Plate, ¼ in. and up	£4		
Plate, 3/16 in. and 5 mm.	£4	2s.	6d.
Sheets, ⅛ in.	£4	7s.	6d.
Beams, Thomas.	£3	2s.	6d.
Angles (Basic)	£3	2s.	6d.
Hoops and strip base	£4	2s.	6d.
Wire, plain, No. 8	£5	7s.	6d.
Wire nails	£5	15s.	
Wire, barbed, 4 pt. No. 10 B.W.G.	£8	15s.	

Armco to Build New Cold Strip Mill

NEW financing for the American Rolling Mill Co., involving approximately $25,000,000, will be voted on by stockholders at the annual meeting May 16. Directors propose to issue not more than $25,000,000 of new convertible debentures, proceeds from the sale of which would be used to refund outstanding 5 per cent convertible notes, due 1938; refund outstanding first mortgage 5½ per cent gold bonds of the Sheffield Steel Corpn., a wholly owned subsidiary; construct a wide cold reduction mill, and add miscellaneous equipment.

The new issue of debentures under the plan will mature in 1945. It is expected to reduce the interest rates through issuance of obligations at this time, due to low money rates.

Under the conversion privilege, holders of the new issue will have the option of converting their holdings into common stock on the basis of 40 shares of $25 par common for each $1,000 principal amount of debentures.

The conversion privilege necessitates a vote to increase authorized common stock to 3,245,000 from the present 2,500,000 shares. This, however, would be reduced to 3,000,000 shares after conversion of present notes, since such conversion would release stock now reserved for exchange for present notes.

Shipbuilding Gains In First Quarter

First quarter gains in the volume of merchant vessels being built throughout the world are shown by the returns made to Lloyd's Register of Shipping from all maritime countries, except Russia, for which no official figures are available. The increase in production is not large, the work under way at the end of the quarter being only about 20,000 gross tons more than the total under way at the end of December 1. But a marked increase is shown in the volume of new orders on which work has been begun. Lloyd's figures include all merchant ships of 100 gross tons and upwards now being built, except in Russia.

As compared with a year ago, however, production figures show an increase of nearly 200,000 gross tons. Germany made the greatest gains during the quarter just ended, with an increase of 55,000 tons, as compared with a decrease of about 40,000 tons for Great Britain and Ireland, and smaller declines for Japan, Italy, France, Denmark and the United States. Gains were made by Sweden, Holland, Spain and Norway. The United States is now building less shipping than any of the other principal maritime countries of the world.

Improvement of Chicago Airport Recommended

WASHINGTON, April 16.—Improvement of Chicago's municipal airport by elimination of railroad tracks which bisect it, extension of runways so as to make it a Class "A" airport, and the widening of an arterial highway leading from the city's loop to the aviation center are recommended in a report submitted to Public Works Administrator Ickes by a special committee appointed to study the problem. The expenditure involved is $11,523,161.

PERSONALS

T. LANE WATSON, assistant sales manager of the bar, strip and semi-finished steel products department of the Carnegie Steel Co., Pittsburgh, has been appointed assistant manager of sales in the Cleveland district of the Carnegie company to fill the vacancy caused by the recent death of Alger R. Williard. Mr. Watson has been connected with the sales office of the Carnegie company in Pittsburgh for 25 years and has occupied his present position for the last two and a half years.

❖ ❖ ❖

S. A. HELLINGS, who last December was elected president of the Stewart Die Casting Corpn., Chicago, has now been made a member of the board of directors. Mr. Hellings has served the company for 21 years. He served his machinist apprenticeship with Darling & Sellers, Keithley, Yorkshire, England. He started with the Stewart company as mechanical correspondent, and worked upward in the management and production departments until in 1928 he was made vice-president and general manager.

❖ ❖ ❖

JOHN R. TILLMAN, for a number of years in charge of the tool engineering department of the Bullard Co., Bridgeport, Conn., has been appointed assistant to DUDLEY B. BULLARD, vice-president in charge of engineering. As chief executive engineer, Mr. Tillman combines the supervision of all departments of engineering.

❖ ❖ ❖

RALPH E. FLANDERS, president of the Jones & Lamson Machine Co., Springfield, Vt., and president of the American Society of Mechanical Engineers, will be guest of honor at a joint meeting of the Milwaukee section of the Society and the Engineers' Society of Milwaukee at the Wisconsin Club on April 18. His topic is "The Engineer and Social Well-Being."

❖ ❖ ❖

RALPH A. TERRELL has joined the Ingersoll Steel & Disc Co. Division of Borg-Warner Corpn., at the West Pullman (Chicago) plant as chief engineer, succeeding S. S. BATTLES who has resigned to become president of the Midwest Stamping & Enameling Co., Morrison, Ill. Mr. Terrell, who is a graduate of Cincinnati University, was formerly superintendent and chief engineer of the South Bend Tool & Die Co., South Bend, Ind., and previous to that efficiency engineer for the Frigidaire Corpn., Dayton, Ohio.

❖ ❖ ❖

WILLIAM M. HAGER has been elected a vice-president of the American Car & Foundry Co., New York. HOWARD C. WICK has been appointed assistant to the president, and will continue also as secretary of the company.

❖ ❖ ❖

JOSEPH F. SHADGEN will deliver an address on "Heat Radiation" before the power division of the Metropolitan Section of the American Society of Mechanical Engineers, at the Engineering Societies Building, New York, on April 22. Two articles by M. Shadgen on this subject recently appeared in THE IRON AGE, one in the Jan. 17 issue and the other in the issue of Feb. 14.

❖ ❖ ❖

G. W. BURRELL, president, Wellman Engineering Co., and CARL K. LENZ, sales manager of Chase Brass & Copper Co., Cleveland, have been elected directors of the Cleveland Chamber of Commerce.

❖ ❖ ❖

CHARLES J. THOMAS, of Buffalo, has been appointed secretary-manager of the Cleveland Engineering Society as successor to CARLTON R. SABIN, who has held the position for several years. Mr. Thomas, who is a native of Buffalo, was engaged in the telephone industry in that city for some time as a draftsman, engineer and later as sales manager of the Federal Telephone & Telegraph Co. Later he was in charge of the Convention Bureau of the Buffalo Chamber of Commerce and from 1924 to 1934 he was executive secretary of the Greater Buffalo Advertising Club. During the World War he served overseas as a First Lieutenant of Infantry.

❖ ❖ ❖

G. LOFBERG has been appointed president and N. S. Peterson, secretary, of SKF Steels, Inc., 40 East Thirty-fourth Street, New York.

❖ ❖ ❖

GEORGE H. RALLS has resigned as director of sales of the parts division of the Chrysler Corpn., to become president of Pressure Castings, Inc., Cleveland. He has been engaged in the parts manufacturing business for many years, having been long identified with the Gabriel Co., manufacturer of hydraulic shock absorbers, where he was president prior to his asso-

T. L. WATSON

S. A. HELLINGS

J. R. TILLMAN

ciation with the parts division of the Chrysler Corpn.

❖ ❖ ❖

E. KAPKE has been made assistant sales manager of the crane division of the Harnischfeger Corpn., Milwaukee.

❖ ❖ ❖

W. C. CRUETZBURG has been placed in charge of tool design at the plant of the Young Radiator Co., Racine, Wis.

❖ ❖ ❖

EDWARD J. BUTLER has been appointed to an executive position in the sales department of the Bunting Brass & Bronze Co., Toledo, Ohio. He will assist in the supervision of the wholesale business of the company as carried on through mill supply and automotive wholesalers. He was formerly identified with the sales department of the Toledo Steel Products Co., and Motor Meter Gage & Equipment Corpn.

❖ ❖ ❖

GEORGE M. VERITY, chairman of the board, American Rolling Mill Co., Middletown, Ohio, sailed for Europe on April 13 to make an inspection of the company's European properties. He expects to study industrial and economic conditions while in Europe, and his itinerary will take him into Italy, France, Germany and England.

❖ ❖ ❖

JOSEPH W. ROYER, works manager of the Medart Co., has been elected vice-president in full charge of manufacturing. His connection with the company dates back to 1915.

❖ ❖ ❖

J. C. WILLIAMS, president, Weirton Steel Co., was guest of honor at a party given him by hot mill employees of the Weirton and Steubenville plants at the Steubenville Country Club on March 30.

The Detroit Electric Furnace Co. has received an order from Fiat Motor of Torino, Italy, for a 1000-lb. Detroit rocking electric furnace for use in Fiat's brass foundry. Fiat Motor is a leading industrial concern of Italy making motor cars, airplane engines and other large industrial equipment. This is the second Detroit furnace purchased by Fiat.

Sales billed by General Electric Co. in the first quarter amounted to $40,393,538, compared with $34,935,551 in the same quarter a year ago. Profit available for dividends on the common stock amounted to $5,390,930, compared with $3,921,961 in the first quarter of 1934.

OBITUARY

W. CROFT VAUGHN, sales manager of the hardware, structural products and fence departments of the Wickwire Spencer Steel Co., New York, died on April 8, in Brooklyn, N. Y., after having been for many years associated with the wire cloth industry. Formerly a member of the sales organization of Clinton Wire Cloth Co., New York, he became manager of the New York district in 1916. When the Clinton company and the Wright Wire Co. consolidated in

W. CROFT VAUGHN

1919, he became manager in the New York district of the newly formed organization. With the formation of the Wickwire Spencer Steel Co., in 1920, he continued in the same capacity until 1926, when he became assistant sales manager of both the hardware and structural products departments of the American Wire Fabrics Corpn. and its parent company, Wickwire Spencer Steel Co. In March, 1931, he was promoted to the position he held at the time of his death. Mr. Vaughn was born at Cornwall-on-the-Hudson, New York, April 12, 1888.

❖ ❖ ❖

JOHN R. DAVIES, formerly superintendent of rolling mills at Duquesne works, Carnegie Steel Co., died at his home at Duquesne, Pa., on April 9, aged 86 years. He was born in Wales, but came to this country when a boy, settling in Chicago. Following his work there in the steel mills, he went to Duquesne to help build the rolling mills of the Allegheny - Bessemer Steel Co. in 1889. The mills were later sold to Andrew Carnegie and Charles M. Schwab, and Mr. Davies became superintendent. He retired in 1903.

❖ ❖ ❖

WILLIS COLLINS, for 20 years a consulting engineer with the Allis-Chalmers Mfg. Co., Milwaukee, died April 7, aged 62 years. He was a native of Milwaukee and a graduate of Cornell University.

❖ ❖ ❖

IRVING W. DOWNING, president of the I. W. Downing Pump Co., Milwaukee, power plant equipment manufacturer, died April 8, aged 73 years. He established the business in 1914.

❖ ❖ ❖

NILS I. LUNDBERG, mechanical engineer, Gisholt Machine Co., Madison, Wis., and noted inventor in the turret lathe and general machine tool field, died April 11 at a Madison hospital, following an operation. He was 53 years of age and a native of Sweden, where he was graduated from the University of Upsala and the Royal School of Engineering in Stockholm. Mr. Lundberg came to America in 1906 and had been associated with the Gisholt company since that time.

❖ ❖ ❖

CLIFFORD ROSS GARDINOR, president of the International Silver Co., Meriden, Conn., died on April 6.

❖ ❖ ❖

EDGAR F. PRICE, vice-president of the Union Carbide & Carbon Corpn., New York, died at his home at Port Chester, N. Y., on April 15, aged 62 years. He became identified, when he was 18 years old, with the Willson Aluminum Co., Spray, N. C., the successors of which formed the nucleus of the Union Carbide & Carbon Corpn. In an experiment in an attempt to produce aluminum, Mr. Price and his associates produced acetylene. When the Willson Aluminum Co. went out of business after trying to market acetylene, Mr. Price joined the Westinghouse company. He later became identified with the Union Carbide Co., of which he rose to the presidency. He also became the executive head of the Electro Metallurgical Co. In 1917 he was appointed vice-president of the newly established Union Carbide & Carbon Corpn. He retired in 1925.

❖ ❖ ❖

ROBERT C. LIND, president, treasurer and founder of the Rockford Machine Tool Co., Rockford, Ill., died April 13 after an illness of four weeks.

THIS WEEK IN WASHINGTON

Complaint against pig iron importations is shelved by NRA.

° ° °

Business Advisory Council recommends granting of Government credit to small industrial concerns.

° ° °

Belgian government to supervise exports to United States because of belga devaluation.

° ° °

NRA gets first request under code for permission to add new open-hearth steel making capacity.

° ° °

Action on NRA and FTC report on steel industry's basing point system is indefinitely postponed.

° ° °

BY L. W. MOFFETT

Resident Washington Editor, The Iron Age

° ° °

WASHINGTON, April 16.—The fuss and feathers raised by the Federal Trade Commission and NRA reports on the basing point system in the iron and steel industry have settled down . . . at least temporarily. . . . It's most anybody's guess as to what will be done with them. . . . The White House has made no statement whatever. . . . With its legislative program jammed as a slothful Congress boon-doggles, it is now a question as to whether the Administration will be compelled to ditch some of its "must" bills. . . . And it is therefore doubted that it will add to its burden by seeking to have Congress do anything about the FTC and NRA basing point reports.

First it would have to map out a program from the reports before making any recommendation to Congress. . . . In view of the sharply conflicting character of the reports this would be a most difficult task in itself. . . . Moreover, the vast and sweeping legislative layout already has stirred growing complaints from business and industry which want a breathing spell and a restoration of confidence. . . . To add to the concern shown by starting a wrangle over the basing point system would no doubt keep recovery "just around the corner." . . . And it has been remarked that recovery has been kept at a dead center so long that it sorely needs something to start it going again. . . . And the best starter would be less reform and more work, as a spokesman for an employee representation group in the steel industry told Senator Wagner at hearings on the Senator's labor disputes bill.

The FTC and NRA reports not only have been pushed to the background . . . for the time being anyhow . . . but the Bankhead-Huddleston bill to compel quotation on an f.o.b., mill basis is taking a nap since Senator Bankhead told constituents in reply to their criticism of the measure that before pushing it he will "give more study to its potential effect upon Alabama industries." . . . Which shows that the Senator has manifested a fairness and breadth of mind that some of his colleagues have not done in their political bushwhacking, urging legislation about which they know nothing and care to know nothing. . . . There is plenty of other disturbing legislation ahead without dragging in more.

The President is represented as being irritated over the slowness of Congress and is said to have implied, seriously or otherwise, that he will keep Congress in session all summer if that is necessary to push his "must" program through. . . . For the sake of the country it is to be hoped this torture does not stare it in the face. . . . The $4,880,000,000 "works relief" program, now under the direction of the President just about as he wanted it, might be a sharp spur to Congress for quicker action . . . and for what the Administration wants. . . There's a lot of patronage in that tidy sum of money, which, according to the undoubtedly cor-

rect *Wall Street Journal*, means spending at the rate of $4.80 a minute from A. D. 1 to the end of 1935. . . . The Administration hopes to have the relief job entirely done by July 1, which likely is another unduly optimistic hope.

Interesting parallel that employment and relief rolls rise together, an anomaly that has given rise to the disturbing belief that the "Why work" bug has spread throughout the nation and made voluntary indigence a popular practice. . . . Unquestionably the vast majority who receive relief are deserving but unquestionably also there are many parasites feeding at the taxpayers' crib. . . . If the huge sum is proving a stimulus to business, as some business reports say, it ought by all means to be so handled that the unworthy are knocked off the rolls. . . . And it is being predicted that this will be attempted under the work relief plan which the President proposes to direct vigorously. . . . His first move in starting the program would indicate an end to the old CWA days when the chief work consisted of shoveling leaves from one side of the street to another and then pushing them back again. . . . For after conferring last Friday with Robert Fechner, Civilian Conservation Corps director, the latter said 300,000 new men would be enrolled in the organization within 60 days, with $600,000,000 to be allotted to this alphabetical agency, which has made a rather good record, as such agencies go.

Harry L. Hopkins, who thinks people are damned dumbbells if they do not appreciate boon-doggling and eurythmic dancing. . . . Huey Long would call it St. Vitus dancing . . . apparently is not going to squander all the money on these artistic pastimes. . . . For the breezy relief administrator has said he expects the public works to continue. . . . Still holding to the Administration hope that the money will put 3,500,000 directly to work, Mr. Hopkins thinks it will break the back of the relief bugaboo. . . . One can hope that Hopkins is at least partially right.

Mayors flocked from all parts of the country last week and conferred with the President to see how much of the money they will get for city projects. . . . And while there is much "I don't know" stuff coming from Government officials as to plans for spending the money, it was stated that a proposal to change the form of land-and-grant is under consideration. . . . Under the plan $900,000,000 would be provided to cities on a 50-50 basis instead of the old basis of a 70-30 ratio by which the Federal Government loaned cities 70 per cent and granted them 30 per cent of funds allocated to States and municipalities. . . . The Mississippi basin projects probably will call for about $300,000,000. . . . Grade crossing elimination is also much in the cards. . . . These dizzy figures will mean requirements for much iron and steel, although huge as they are they are small compared with potential requirements that would be absorbed by private initiative if confidence were fully restored. . . . Witness the MAPI survey estimating a potential demand equivalent to $18,000,000,000 for capital equipment goods, the greatest of all unemployment chasers with no back-breaking taxes tacked on.

Industry generally is skeptical of the effect of the work relief fund, not only because of fear that much of it will be dissipated for no good purpose but that only private initiative can bring back real recovery and that it will do so when more attention is given to sound political policies, including a cutting down rather than a jacking up of the public debt and the fixing of a sound currency, less Government competition with business, etc. . . . And more assurance to industry as to labor legislation.

The past week has been more encouraging in this direction. . . . For despite plugging for the Wagner bill by various sources, including Chairman Biddle of the National Labor Relations Board, it is believed the measure is losing rather than gaining support. . . . Mr. Biddle told the Senate Finance Committee it would be "intellectual dishonesty" to extend Section 7-a in NRA without teeth to enforce it and he thinks the Wagner bill is the necessary enforcing instrument. . . . His testimony revealed an apparent plan to tack the Wagner bill as an amendment to the NRA bill if the former is not enacted before passage of the NRA bill. . . . Or perhaps it was sought to give the impression that this plan is being considered so that the Wagner bill can be jammed through. . . . As Mr. Biddle was testifying the President was conferring on labor legislation with Senator Wagner and Senator Costigan but there was no intimation that the President was supporting the Wagner bill. . . . The Chief Executive has never indicated his position on the measure but it is still doubted that he will support it . . . this is, however, only a "best bet" which may not be the best bet at all.

Meanwhile Donald Richberg, acting NRA chairman, chief coordinator and general pooh-bah for the Administration, said he had finally read the Wagner bill, but he would not comment on the measure. . . . In the past he has said he favors the principle of the bill so far as it concerns the setting up of "separate and adequate" machinery to enforce Section 7-a. . . . At that he made it plain he was speaking only for himself and not for the Administration. . . . The Wagner bill contains at least one principle which Mr. Richberg has strongly opposed and supposedly still opposes strongly. . . . That is the majority rule principle. . . . Because of his stand against the majority rule principle Mr. Richberg has been vigorously criticized by organized labor.

The Wagner bill, according to the general view, will not be passed if NRA is extended and it is likewise the general opinion that NRA will be extended but it faces much hostility in Congress that appears to be growing. . . . NRA continuation found support at the hands of the Consumers Goods Industries Committee of which George A. Sloan is chairman but some consumer interests are opposed to its extension. . . . Industries generally favor its continuation, and the steel industry as a whole is with the majority, but most of them appear to be against the new proposal in the NRA bill to impose codes. . . . A substitute NRA bill proposed by Senator McCarran, Democrat, Nevada, meets much favor at the hands of Congressional opponents of the Administration bill.

The McCarran proposal would set up voluntary codes only. . . . Industries could join or not as they please and there would be no distinction between intrastate and interstate commerce and thus the vexing question of constitutionality of regulating business would be done away with. . . . Section 7-a, however, would be continued, meaning that the most troublesome feature of NRA would be retained. . . . Meanwhile NRA itself is nervously marking time, doing as little as possible, as it waits to see what Congress will do with it and the bedraggled Blue Eagle. . . . Mr. Richberg himself wants the old bird displaced by insignia more symbolic of peace and the country can stand a lot of peace. . . . The attacks on the Administration NRA bill, the proposed substitute of Senator McCarran and further revision proposed by Senator Borah indicate the measure, if enacted, may reflect the rough sledding it has before it. . . . While extension of the Recovery Act is considered to be probable, the prediction is freely made that it will be greatly modified when it reaches its final form. . . . Senator Borah's constant hammering at the act

ever since it became a law has finally yielded him Administration recognition of prime importance. . . . This is shown by the fact that he was called in by Administration spokesmen to confer on the bill and press his points. . . . He is demanding complete restoration of the anti-trust laws, an outright declaration against price fixing and a plain statement that the Government is not seeking to interfere with purely intrastate business. . . . There are important groups in Congress who share either the McCarran or Borah views, and their strength promises to be an important factor in modifying the bill. . . . Some say it may be so greatly modified that it will have no appeal to business and industry generally.

Even some Administration supporters agree with some critics that the bill as proposed by the Administration lends itself to price fixing to a greater extent than does the present law and is entirely unsatisfactory to Senators like Borah, Nye, LaFollette, who insist it virtually nullifies the anti-trust laws. . . . There is also growing complaint against code provisions which bar or limit construction of certain types of new productive capacity and this matter may receive the attention of Congress when the bill is under discussion.

The steel code bars new construction of blast furnace, Bessemer converter or open-hearth furnace capacity except upon sanction of the code authority and NRA. . . . The first formal request for exemption from this code provision has been made to NRA. . . . It comes from the Northwestern Barb Wire Co., Inc., Sterling, Ill., which wants to initiate the construction of new open-hearth or Bessemer capacity. . . . Suggestions or objections concerning the application of the company, seeking exemption from Section 2, Article V, of the iron and steel code, must be submitted to Deputy Administrator R. W. Shannon, Room 502, Albee Building, Fifteenth and G Streets, N. W., Washington, before May 2.

• • •

Johnson Final Witness at NRA Hearing

Lasting six weeks, the hearings before the Senate Committee on Finance on the Administration's NRA bill will be brought to an end Thursday with a fitting climax in the form of testimony by General Hugh S. Johnson. The colorful former recovery administrator has strongly criticized administration of NRA since he resigned as its head and is expected to have some flashy remarks to make with prospects of having a large audience. He has said NRA is as "dead as a dodo" and recommendations to bring it to life may be expected to be offered by him. His position with respect to NRA is quite different from that of the President who has said NRA "is not an Orphan Annie, but is a very live young lady."

Senator Harrison, chairman of the committee, it is believed, will rush a report on the measure as soon as the vast volume of testimony is gone over and make an effort to get it through the Senate as soon as possible. Administration forces have been disturbed over the prospects of getting the bill extended before the present law expires, June 16, but now express confidence that they will be successful in doing so. It seems clear, however, that the Administration bill will be considerably revised before it negotiates its way through Congress. Compromise on the part of the Administration appears to be inevitable in view of the opposition to it in its present form and proposals under way for revision, to say nothing of an entire substitute prepared by Senator McCarran of Nevada. While the greater part of the witnesses before the committee favored extension of the law, many suggested revisions in the way of removal of price-fixing devices and tightening up of the anti-trust laws.

• • •

Pig Iron Complaint Is Shelved

The complaint filed with NRA recently by eastern merchant blast furnace interests against pig iron imports has been shelved by order of President Roosevelt. The NIRB last Saturday announced that the President had directed "that no further action be taken at this time on a complaint under the provisions of Section 3(e) of the National Industrial Recovery Act filed by a tariff committee representing the eastern group of merchant pig iron producers by authority of the American Iron and Steel Institute, with respect to imports of pig iron."

This means, of course, that the complaint actually has been dismissed. The action was anticipated, for the Administration has determinedly fixed its mind upon reciprocal tariff agreements and its spokesmen instead of letting down on the campaign are intensifying their drive against "tariff barriers."

New England governors were rebuffed, according to the daily press, when they conferred at the White House and urged protection against the rapidly rising imports of Japanese cotton cloth, produced at coolie wages. Nor will the governors probably get far in taking their case to their delegations in Congress, sympathetic as the latter are.

The decision in the pig iron case, so the NIRB reported, was made after an examination of the complaint and a report by the board. The complaint was made to the so-called import section of NRA, which reported to the board.

"Pig iron is imported into the United States chiefly from the Netherlands and British India," said the NIRB announcement. "The trend of imports, both in absolute amount and in ratio to domestic production of merchant pig iron, has been generally downward from the second quarter of 1933 before the adoption of the iron and steel code. Furthermore, competition from imports on a price basis was less severe during 1934 than during 1932 and 1933 prior to the depreciation of the dollar."

Fundamentally, the purpose of the import section of NRA and the policy of the State Department are in direct conflict and the State Department is riding high in its tariff bargaining scheme. The import section of NRA is not riding at all. It is of no service to American industry and cannot be in view of the present situation.

The dismissal of the pig iron complaint took no heed of the fact that imports complained of affect the northern Atlantic Seaboard, where the pig iron market is greatly restricted and is seriously affected by comparatively small imports. It is not therefore a question of the trend of imports "both in absolute amount and in ratio to domestic production."

• • •

To Supervise Belgian Exports to United States

The State Department announced for the Belgian Government that the latter intends to supervise the prices quoted by Belgian exporters with a view to preventing serious disturbance detrimental to American interests. This announcement was made in recognition of complaints in connection with the recent American-Belgian reciprocal tariff agreement and the subsequent devaluation of the belga by 28 per cent.

The American iron and steel industry showed concern over the agreement when it was signed, inasmuch as important iron and steel products were given reduced duties. When the belga was devalued added apprehension arose. The State Department indicated that there was no reason for concern, even in the face of the depre-

ciation of the belga. Yet its present announcement would indicate that it is sufficiently apprehensive to seek to reassure American industry against the dangers of unduly rising imports from Belgium.

The Department said that some of the complaints coming to it appeared to be founded on the impression that the United States Government had failed to take into account during the trade agreement negotiations the possibility of an early devaluation of the belga. It called attention to the fact that the Department was aware at that time of the prospective devaluation and accordingly included a safeguarding clause in the agreement. As pointed out by THE IRON AGE, the Department had been previously advised that the belga likely would be depreciated, and the safeguarding provision has been quoted heretofore. In effect it provides that in case of a "wide variation" in the rate of exchange between the two countries the agreement may be modified or terminated on 30 days' written notice.

In a letter of April 8 the Belgian Ambassador informed Secretary of State Hull of the nature of the proposed Belgian supervision of export prices. It is to be done through export licenses.

The tariff agreement becomes effective May 1. Iron and steel are not included in the list of products which are first to be subjected to export licenses, to be wholly in the hands of the Belgian Government.

It is also true that the lowered American duties granted to Belgium are also granted to all other iron and steel making countries which export to the United States which have made no such agreement as to "supervision of exports." In the minds of many the supervision will be of doubtful value.

• • •

Protest Southern Pig Iron Differential

Protest against the $2.58 differential charged consumers of Southern pig iron north of the Ohio River was laid before the Senate Committee on Finance at NRA hearings last Saturday. The protest was presented by Representative Boehne of Indiana for a group of users of pig iron and rough castings in Evansville, Ind., and vicinity. In addition to asking that the so-called discrimination in price of Southern pig iron be removed, the protestants also urged that all price fixing be removed from codes and called attention to the Clayton act, which, they pointed out, makes discrimination in price illegal.

The letter said:

We beg to bring to your attention unfair price fixing and discrimination against us as regards the price of Southern pig iron shipped to the northern bank of the Ohio river, as compared to the price charged to purchasers of this same pig iron on the southern bank of the same Ohio river.

Since adoption of the iron and steel code under the NIRA, pig iron producers in the Birmingham district charge consumers on the northern bank of the Ohio river $2.88 more per ton of pig iron than the price charged to consumers on the southern bank of the Ohio river, while the additional cost of transportation to the northern bank of the river is only 30c. per ton, thereby discriminating unfairly against consumers of pig iron on the northern bank of the Ohio river to the extent of $2.58 per ton, which discrimination will seriously affect the operation of many industries in this district.

We appeal for relief from this unfair discrimination and strongly urge you take whatever action is necessary to secure the elimination of all price fixing from codes permitted under NRA, for if price fixing is tolerated it will be abused, as shown by the above example.

We do understand that under the Clayton act and other laws of our country, discrimination in price between purchasers is absolutely illegal, and undoubtedly such gross discrimination as set forth in this report, namely a difference of $2.58 per ton of pig iron, to consumers of this material in territories immediately adjoining, was never intended by the legislative and executive branches of our Government. If continued, such price fixing and discrimination will prove ruinous to many industries and we hope you may decide it should not be tolerated.

Numerous appeals to administrators of the NIRA and to pig iron furnaces at Birmingham for relief from unfair discrimination due to this price fixing, have been entirely unsuccessful.

The letter was signed by the following: Farm Tools, Inc., Vulcan plow division; Advance Stove Works, J. S. Hopkins, secretary-treasurer; Hartig Foundry Co., S. W. Hartig, president; Sunbeam Electric Mfg. Co., J. Harry Schrader, vice-president; Sernal, Inc., W. E. Baker, works manager; Blount Plow Works, V. A. Burch, president; the F. Grote Mfg. Co., Ernest A. Grote, president; T. Holtz Co., H. Holtz, secretary and treasurer; Keck Sonnerman Co.

Protest against price fixing in codes also was made to the committee by Fred Brenckman, representing the National Grange. He said the Grange wants Congress to enact legislation directing the Federal Trade Commission to investigate the farm implement and machinery industry "so as to definitely establish whether or not price fixing and unfair trade practices are responsible for the unreasonably high prices that farmers are asked to pay for such equipment."

• • •

15 Per Cent Price Cut Order Meant Nothing

The famous Presidential Order (No. 6767) permitting the quotation of prices to Government agencies of not more than 15 per cent below the prices filed with code authorities appears to have had no great effect upon tie bids in one direction or another. So the NIRB has reported to the President. The report, signed by Acting Chairman Donald Richberg, said that it appears that the discount permitted by the order has actually been used in relatively few industries covered in a study by the NRA Research and Planning Division "and that there is only an inference that it has affected tie-bidding in certain cases." It was pointed out that while in some industries "there was a decrease in the number of tie-bids after the issuance of the order, yet in others there was an increase." The order was issued June 29, 1934.

National Income Up 14 Per Cent in 1934

NATIONAL income—the net value of the goods and services produced—amounted to $47.6 billion in 1934, an increase of 13.9 per cent over the total of $41.8 billion for 1933, according to the annual estimate of the National Industrial Conference Board. Per capita income produced during 1934 was $377, or $44 above the per capita figure for 1933.

From 1933 to 1934 wholesale prices of commodities increased 13.7 per cent. The cost of living rose 6.1 per cent. The effective increase of national income measured by purchasing power was, therefore, considerably less than the increase measured in dollars.

Comparing 1934 with 1929, when national income reached its highest peak of $83.0 billion, the board found that the income level declined 42.7 per cent, wholesale prices 21.4 per cent, and the cost of living 20.6 per cent. The purchasing power of the national income produced in 1934 was, consequently, about 27 per cent below the pre-depression peak.

Per capita income of $377 produced in 1934 was 44.8 per cent below the 1929 level, in dollars, and 30 per cent below it in purchasing power.

Recommends Granting Credit to Small Industrial Concerns—Urgency Growing

WASHINGTON, April 16.—Recommendation for an immediate study by Government bodies and investment bankers looking to granting of credit to small industries is made in a report submitted to Secretary of Commerce Roper by the Business Advisory and Planning Council of the Department of Commerce. Made public yesterday by Mr. Roper the report suggests that the study recommended be made by the Reconstruction Finance Corporation, Federal Reserve Board and Securities and Exchange Commission in cooperation with investment bankers "to the end that facilities be offered sound, small industries for the acquisition of needed capital."

The report indicates that the credit requirements of industrial concerns which cannot be satisfied from normal sources are not so large as they appeared to be six months ago and that the credit needs of small industries are being more adequately met by commercial banks and other financial institutions.

The report declares that the inability of the smaller concerns to modernize their machinery and equipment explains in no small measure the continued depression in many of the capital goods industries.

This conclusion is reached after the report points out that with the continued restoration of business activity the need of small industry for intermediate and long-term capital has become increasingly urgent.

"There seems to be little doubt that a large number of the smaller manufacturing concerns have been able to withstand the effects of the long-drawn-out depression in part through sharp curtailment of expenditures on repairs of building and equipment and, in part, through the reduction of inventories of raw materials, parts and supplies to a hand-to-hand basis," says the report. "Not only is existing equipment wearing out at a rapid rate but it is also becoming obsolete. The necessity for buying raw materials, etc., in limited quantities prevents concerns from acquiring them at satisfactory prices. Both factors operate to increase manufacturing costs and to reduce profits.

"It is clear that the capital structure of American industry as a whole has been impaired by these and other factors and the ability of the smaller industrial concerns, in particular, to borrow from the banks for working capital purposes has been correspondingly lowered. In this connection, the Council has been greatly impressed by the fact that the bulk of the advances and commitments made by the Federal Reserve banks have been for periods of more than one year."

The report says that since small industry plays a very important part in the economic life of the nation and since its activities contribute so much to those of the larger plants, "it would seem the part of wisdom to provide the smaller, sound industrial concerns with the long-term credit facilities which they require." This, it is declared, would make for safer commercial banking as well as for cheaper and better financing for industry as a whole.

"This is sound and should be a natural function of the investment banker acting as the channel for the safe investment of private funds in small enterprises," the report declares.

"At the moment, this channel is blocked by the too rigid requirements of the Securities Act; by a general fear of the future on the part of investment bankers, and by the waiting attitude of the investing public.

"The need exists and is of paramount importance to recovery. Mainly it is an investment need, rather than a credit need. It should be fulfilled."

To obtain a factual basis for the study a survey was made by the Bureau of the Census of the Department of Commerce. Replies to questionnaires from 6158 manufacturers employing not less than 21 nor more than 250 wage earners were tabulated. Of these, 4387, or 71 per cent, were classified as borrowers and 1771, or 29 per cent, as non-borrowers or as concerns with no credit experience. Forty-five per cent, or 1964 of the borrowing concerns, reported credit difficulties. Commercial bankers were the normal sources of credit for working capital for 1872 concerns. Of the 2423 concerns reporting no credit difficulty, 2217 indicated their customary sources of credit, 90 per cent of these stating that banks were the normal source of their working capital loans.

Code Cost Systems Defined by NRA

WASHINGTON, April 16.—In a memorandum sent to all code authorities and State and regional NRA directors, the NRA has emphasized the distinction between mandatory and permissive cost formulas or cost systems. Only mandatory systems which are integral parts of codes when approved, or those specifically approved by NRA, are subject to enforcement.

In the memorandum, the Administration called attention to the following:

(1) There are two types of cost formulas or cost systems—those that are mandatory and used in connection with selling below cost provisions in codes, and those that are permissive and used for educational purposes only to the extent found practicable.

(2) Only mandatory systems which are integral parts of codes when approved, or those specifically approved by NRA, are subject to enforcement. There are many instances where reference is made in a code to a mandatory system which has not yet been approved by the board. No attempt should be made to enforce such unapproved systems.

(3) Code authorities or any NRA agency who, through misunderstanding or otherwise, have attempted such enforcement have acted without authority.

Wrenches: The supplementary code authority for the wrench manufacturing industry has proposed an amendment forbidding offers to sell, as well as actual sales, at terms other than those filed by a member of the industry. The amendment would revise Section 2 of Article V of the supplementary code to read as follows:

"No member of the industry shall sell to any purchaser, or offer to sell to any prospective purchaser, by any means whatsoever any product of the industry at a price lower or at a discount greater or on more favorable terms than set forth in published price sheets of such member at the time outstanding and in force under the conditions applicable to such sale therein set forth."

The supplementary code authority also has applied for approval of its budget and basis of contribution for the period May 1, 1935, to May 1, 1936. The proposed budget totals $25,000.

Fabricated Metal Products: The code authority for the fabricated metal products manufacturing and metal finishing and metal coating industry has applied for approval of an additional code assessment of 40c. per employee to be paid on the average number of employees during

the period from Jan. 1, 1935, to March 31, 1935, both dates inclusive, for the budgetary period from Feb. 15, 1935, to June 15, 1935.

The code authority has set forth in its application for the additional assessment the fact that the number of employees in the industry on which the original basis of assessment was made was overestimated by approximately 140,000. The original code budget assessment was 50c. per employee.

Oxy-acetylene: The code authority for the oxy-acetylene industry has made application to the NIRB for approval of a $32,650 budget, and the basis of contribution, for the period from May 1, 1935, to April 30, 1936.

Shovel, Dragline and Crane: The NIRB has approved an amendment to the code for the shovel, dragline and crane industry redefining the industry to include portable drilling machines. The amendment becomes effective April 26, unless good cause to the contrary is shown.

Machine Knife: The code authority for the machine knife and allied products manufacturing industry has made application for approval of a $8,785 budget, and the basis of contribution, for the calendar year 1935. The proposed basis of contribution provides that each member of the industry shall be assessed 4.16 mills on the basis of his net sales during the calendar year 1934, such assessments to be paid in quarterly installments.

Wagner Labor Bill Condemned By Business Editors Following Questionnaire

A SURVEY just completed by the committee on labor problems of the Associated Business Papers and the National Conference of Business Paper Editors, brought out that practically every industry served by this group of 125 business publications, is unalterably opposed to the proposed Wagner labor bill. The main purpose of this legislation would be to "promote equality of bargaining power between employers and employees, to diminish the causes of labor disputes, to create a National Labor Relations Board, and for other purposes."

Not only did these editors hold that industry is opposed to such legislation but a majority of them pointed out that there is no existing need for any labor relations legislation. In many instances they contended that relations between labor and management would be closer and more amicable if outside interferences would be removed from their negotiations.

Answers to a questionnaire issued to these editors revealed that about 85 per cent of them felt that the various companies served by their publications were opposed to the bill. The remaining 15 per cent held that their fields would not be directly affected by the proposed act. A substantial share of this group, however, felt that the indirect effects would be harmful.

Among the reasons advanced in support of the general opposition were:

1. Legislation of the type attempted in the Wagner bill is unworkable and unfair. The effects of the legislation will be harmful by breeding dispute rather than disposing of it.

2. The Wagner labor bill is considered a possible opening wedge toward a 30-hr. week and toward some further plan of labor dictatorship.

3. The proposed legislation is looked upon as an attempt on the part of the American Federation of Labor to become the spokesman instead of allowing the minority to speak for itself. Its enactment would foment a new and more bitter series of labor disputes than any we have known under the NRA to date.

Editors were questioned as to whether or not a need existed for such or similar legislation in the fields covered by their publications. In the responses, 71 per cent contended that there was no need for such drastic legislation. They brought out that in general employers and workers in industry are enjoying harmonious relations. Only two editors maintained that there existed a definite need for improved relationships between labor and management, while a few held that such a need was questionable. Not a single editor argued that the proposed Wagner bill filled any need which could not be met much more simply and equitably in other ways.

"So far as I can see," said one editor, "there is no need for such legislation. It is proper that labor should be entitled by law to bargain collectively with employers. It is not proper that labor should be set up as an armed camp and led to feel that its interests are opposed to the interests of employers. It is not proper that legislation should be so worded as to force labor to join professional unions by having it made impossible for them to take part in an employee representation plan based on educational and mutual interest activities."

Steel Corporation Shipments Make Sharp Gain in March

MARCH steel shipments of the United States Steel Corpn. rose to 668,056 tons from 583,137 tons in the preceding month and also exceeded the total for March, 1934, which was 588,209 tons. Last month's showing was the best for March since 1931.

The March movement was sufficient to engage the corporation's finishing capacity at 41.5 per cent of capacity.

MONTHLY SHIPMENTS OF STEEL PRODUCTS BY UNITED STATES STEEL CORPN.

				1933		1934		1935	
Month	1930	1931	1932	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity	Shipments	Per Cent of Capacity
January	1,104,168	800,031	426,271	285,138	17.7	331,777	19.8	534,055	31.9
February	1,141,912	762,522	413,001	275,929	18.5	385,500	26.3	583,137	39.2
March	1,240,171	907,251	388,579	256,793	15.3	588,209	36.6	668,056	41.5
April	1,188,456	878,558	395,091	335,321	21.6	643,009	41.5	.....	...
May	1,203,916	764,178	338,202	455,302	27.1	745,063	44.4	.....	...
June	984,739	653,104	324,746	603,937	37.4	985,337	61.2	.....	...
July	946,745	593,900	272,448	701,322	45.1	369,938	23.0	.....	...
August	947,402	573,372	291,688	668,155	39.8	378,023	23.1	.....	...
September	867,282	486,928	316,019	575,161	35.6	370,306	23.0	.....	...
October	784,648	476,032	310,007	572,897	35.5	343,962	20.6	.....	...
November	676,016	435,697	275,594	430,358	26.7	366,119	22.9	.....	...
December	579,098	351,211	227,576	600,639	38.7	418,630	26.1	.....	...
Plus or minus yearly adjustment.	(40,259)	(6,040)	(5,160)	(44,283)	...	(19,907)	...	.....	...
Total for year	11,624,294	7,676,744	3,974,062	5,805,235	30.1	5,905,966	30.6	.....	...

Fabricated Structural Steel

Awards in Good Volume—New Projects Decline

LETTINGS of 32,025 tons, the second largest this year, are swelled by 16,000 tons for a strip steel mill for the Great Lakes Steel Corpn. at Ecorse, Mich., and 5000 tons for spillway gates for the Fort Peck dam in Montana. New projects of 5700 tons compare with 48,868 tons last week and 9300 tons two weeks ago. The largest new jobs include 1200 tons for a distillery at Louisville, Ky., and 1000 tons for an army base at Boston. Plate awards total 4410 tons with 4000 tons pending. The Cherry Creek retarding dam near Sullivan, Colo., will require 1296 tons of sheet piling. Structural steel awards for the week follow:

NORTH ATLANTIC STATES

Worcester, Mass., 400 tons, hospital ward and surgical unit, to Haarmann Steel Co.

Bourne-Wareham, Mass., 250 tons, bridge, to Boston Bridge Works, Inc.

Brockton, Mass., 150 tons, store, to J. E. Cox Co.

Cranston, R. I., 150 tons, junior high school, to Providence Steel & Iron Co.

Trumbull, Conn., 135 tons, bridge, to McClintic-Marshall Corpn.

Hartford, Conn., 300 tons, Trinity College building, to Ingalls Iron Works.

Tupper Lake, N. Y., 140 tons, school, to Bethlehem Fabricators, Inc.

New York, 840 tons, public school No. 149 in Jackson Heights, to Harris Structural Steel Co.

New York, 310 tons, highway bridge in Bronx, to Phoenix Bridge Co.

New York, 1340 tons, public school No. 43, to Bethlehem Fabricators, Inc.

Brooklyn, 320 tons, school, to Bethlehem Fabricators, Inc.

Putnam Valley, N. Y., 140 tons, school, to Belmont Iron Works.

Fort Wadsworth, Staten Island, 205 tons, grade elimination, to McClintic-Marshall Corpn.

Buffalo, 250 tons, J. N. Adam & Co. department store, to McClintic-Marshall Corpn.

Philadelphia, 270 tons, Nurses' Home, St. Marys' Hospital, to Belmont Iron Works.

Philadelphia, 270 tons, St. Mary's hospital, to Belmont Iron Works.

Philadelphia, 125 tons, mill building for E. J. Lavino & Co., to Norris Iron & Wire Co.

Plymouth Meeting, Pa., 130 tons, mill building, to Norris Iron & Wire Co.

Cumberland, Md., 700 tons, high school, to Lehigh Structural Steel Co.

SOUTH AND SOUTHWEST

State of Texas, 321 tons, two bridges in Howard County and Dickens County, to Pittsburgh-Des Moines Steel Co.

Texas County, Okla., 250 tons, State highway bridge, to Patterson Steel Co.

Beardsley, Ariz., 725 tons, tainter gates, to Mississippi Valley Structural Steel Co.

Beardsley, Ariz., 500 tons, flume, to Consolidated Steel Corpn.

Phoenix, Ariz., 750 tons, material for Maricopa County Water Conservation District, to Mississippi Valley Structural Steel Co.

State of Florida, 115 tons, highway work in Marlin County, to an unnamed fabricator.

CENTRAL STATES

Cincinnati, 120 tons, Jergens Co. building, to Southern Ohio Iron Works.

Ferdinand, Ind., 250 tons, convent building, to Bedford Foundry & Machine Co.

Hammond, Ind., 150 tons, filtration plant, to Gage Structural Steel Co.

Ecorse, Mich., 16,000 tons, Great Lakes Steel Corpn. hot strip mill, to Whitehead & Kales Co. and Fort Pitt Bridge Works Co.

Christian County, Mo., 140 tons, bridge, to Stupp Brothers Bridge & Iron Co.

Harrison County, Mo., 120 tons, bridge, to St. Joseph Structural Steel Co.

Glover, Ill., 460 tons, State highway bridge, to Mississippi Valley Structural Steel Co.

WESTERN STATES

Fort Peck, Mont., 5000 tons, spillway gates, to R. C. Mahon.

South San Francisco, 425 tons, underpass for Southern Pacific Co., to American Bridge Co.

Delano, Cal., 132 tons, underpass for Southern Pacific Co., to American Bridge Co.

Los Angeles, 125 tons, cement plant addition, to Pacific Coast Steel Corpn.

San Diego, Cal., 200 tons, exposition building, to Consolidated Steel Corpn.

Almira, Wash., 210 tons, Government warehouse, to an unnamed bidder.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Boston, 1000 tons, United States Army base.

East Boston, 350 tons, race track.

Gardner, Mass., 100 tons, stove manufacturing plant addition.

Rome, N. Y., 250 tons, State hospital; bids April 24.

THE SOUTH

Nashville, Tenn., 575 tons, S. H. Kress Co. store.

Atlanta, Ga., 300 tons, building for Chevrolet Motor Co.

Louisville, Ky., 1200 tons, distillery.

State of Texas, 525 tons, bridges.

CENTRAL STATES

Toledo, 250 tons, four buildings for Libby Owen-Ford Co.; one taking 70 tons, placed with Fort Pitt Bridge Works Co.

Elyria, Ohio, 400 tons, addition for Western Automatic Machine Screw Co.; American Bridge Co. low bidder.

Cook County, Ill., tonnage not estimated, 40 overhead crossings.

Chicago, 250 tons, International Harvester Co. building.

Chicago, 300 tons, factory building.

Alton, Ill., 6000 tons, Mississippi River dam No. 26; American Bridge Co. low bidder through Engineering Construction Co., which is low on general contract.

State of South Dakota, 225 tons, bridges.

St. Louis, 175 tons, addition to service building for Chevrolet Motor Co.

WESTERN STATES

Nampa, Idaho, 200 tons, subway.

FABRICATED PLATE

AWARDS

Carteret, N. J., 470 tons, five storage tanks for General American Transportation & Storage Co., to Graver Tank & Mfg. Co.

Pittsburgh, 368 tons, 18 tanks for three barges for American Barge Line, to McClintic-Marshall Corpn.

Los Angeles, 3200 tons, material for Department of Water and Power, Specification 1641, to Southwest Welding & Mfg. Co.

Seattle, 370 tons, tanks for Century Brewing Co., to Commercial Boiler Works.

NEW PROJECTS

Toledo, 100 tons, 30-in. welded pipe.

Tappen, Ohio, 700 tons, 18 and 20-in. welded steel pipe for relocation of East Ohio Gas Company's lines in connection with Muskingum Conservancy project; bids by United States Engineer, Zanesville, Ohio, April 19.

Chicago, 200 tons, tanks for Fleischmann Malting Co.

Port Arthur, Tex., 3000 tons, solvent unit for Texas Co.

SHEET PILING

AWARDS

Seattle, 150 tons, Railway Avenue seawall, to Wallace Bridge & Structural Steel Co.

NEW PROJECTS

Denver, 1296 tons, Cherry Creek retarding dam near Sullivan; bids April 24.

Alton, Ill., 211,000 sq. ft., dam No. 26 in Mississippi River; Engineering Construction Co., New York, low bidder.

Railroad Equipment

United States Navy Department, Bureau of Supplies and Accounts, Washington, has ordered two Diesel-electric switching locomotives from American Locomotive Co.

Key System, Ltd., is inquiring for 40 articulated units of two cars each and 14 extra single bodies.

Soviet Government is in the market for 20 locomotives.

Board of Transportation, New York, is expected to enter the market in June for 500 subway cars for the independent subway system.

RAILS

San Francisco has opened bids on 235 tons of 105 and 110-lb. rails on which Columbia Steel Co. is low bidder.

Missouri Pacific has announced that it has purchased $325,000 worth of new rails and $800,000 worth of tie plates, anchors and fastenings, but officials decline to disclose tonnages or from whom purchased. However, it is understood that the rail purchases total approximately 9000 tons, the tie plates, 5000 tons, and the anchors and fastenings, etc., 3000 tons.

Current Metal Working Activity Statistically Shown

These Data Are Assembled By THE IRON AGE From Recognized Sources And Are Changed Regularly As More Recent Figures Are Made Available. Boldface Type Indicates Changes This Week

	March, 1935	February, 1935	March, 1934	Three Months, 1935	Three Months, 1934
Raw Materials:					
Lake ore consumption (gross tons)[a]	.....	2,467,269	2,189,566	.....	5,573,615
Coke production (net tons)[b]	.....	2,873,432	3,129,973	.....	8,336,252
Pig Iron:					
Pig iron output—monthly (gross tons)[c]	1,777,028	1,608,552	1,619,534	4,862,916	4,098,433
Pig iron output—daily (gross tons)[c]	57,098	57,448	52,243	54,032	45,381
Castings:					
Malleable castings—production (net tons)[d]	.....	41,377	43,438	.....	107,794
Malleable castings—orders (net tons)[d]	.....	41,225	42,961	.....	112,056
Steel castings—production (net tons)[d]	.....	29,687	39,491	.....	95,661
Steel castings—orders (net tons)[d]	.....	31,725	60,046	.....	122,040
Steel Ingots:					
Steel ingot production—monthly (gross tons)[e]	2,830,700	2,742,125	2,761,438	8,406,995	6,915,785
Steel ingot production—daily (gross tons)[e]	108,873	114,255	102,275	109,182	88,664
Steel ingot production—per cent of capacity[e]	49.18	51.61	46.45	49.32	40.27
Employment in Steel Industry:					
Total employees[e]	.....	420,397	419,277	.....	405,196
Total payrolls (thousands of dollars)[e]	.....	44,213	41,263	.....	112,566
Average hours worked per week[e]	.....	35.6	33.9	.....	32.4
Finished Steel:					
Trackwork shipments (net tons)[e]	.....	2,892	4,446	.....	10,597
Sheet steel sales—(net tons)[f]	.....	184,355	158,244	.....	552,062
Sheet steel production (net tons)[f]	.....	219,062	220,282	.....	578,734
Fabricated shape orders (net tons)[g]	.....	70,980	105,537	.....	272,425
Fabricated shape shipments (net tons)[g]	.....	65,430	65,728	.....	170,860
Fabricated plate orders (net tons)[d]	.....	15,064	38,924	.....	69,462
Reinforcing bar awards (net tons)[e]	17,335	22,265	19,300	55,200	51,300
U. S. Steel Corpn. shipments (tons)[b]	668,056	583,137	588,209	1,785,348	1,305,486
Ohio River Steel Shipments[hh]	.....	64,369	47,897	.....	106,379
Fabricated Products:					
Automobile production U. S. and Canada[dd]	*447,561	358,658	345,443	*1,109,591	749,532
Construction contracts (37 Eastern States)[i]	$123,043,500	$75,047,400	$178,345,800	$297,864,500	$461,525,800
Steel barrel shipments (number)[d]	.....	402,928	703,101	.....	1,982,362
Steel furniture shipments[d]	.....	$1,064,219	$955,633	.....	$2,846,547
Steel boiler orders (sq. ft.)[d]	.....	281,646	375,774	.....	838,643
Locomotive orders (number)[k]	8	1	3	9	23
Freight car orders (number)[k]	0	806	522	830	20,899
Machine tool index[l]	62.3	53.0	48.1	†60.3	†50.9
Foundry equipment index[ll]	.....	75.7	75.4	.....	†59.5
Foreign Trade:					
Imports of pig iron (gross tons)[m]	.....	10,741	20,674	.....	43,337
Imports of rolled steel (gross tons)[m]	.....	11,024	6,822	.....	20,461
Exports of all rolled steel and iron (gross tons)[m]	.....	63,739	87,916	.....	253,309
Exports, finished steel (gross tons)[m]	.....	59,147	79,854	.....	227,394
Exports of scrap (gross tons)[m]	.....	156,332	173,165	.....	336,321
British Production:					
British pig iron production (gross tons)[n]	553,200	483,100	503,600	1,557,500	1,359,300
British steel ingot production (gross tons)[n]	841,900	769,500	834,500	2,369,200	2,253,000
Non-Ferrous:					
Lead production (net tons)[o]	.....	27,398	35,502	.....	108,421
Lead shipments (net tons)[o]	.....	32,518	30,321	.....	90,010
Zinc production (net tons)[p]	36,216	33,072	33,845	104,902	97,218
Zinc shipments (net tons)[p]	41,137	34,903	32,877	111,578	92,018
Deliveries of tin (gross tons)[r]	5,495	3,905	3,835	14,000	10,085

*Preliminary. †Three Months' Average.

Sources of figures: [a] Lake Superior Iron Ore Association; [b] Bureau of Mines; [c] THE IRON AGE; [d] Bureau of the Census; [dd] When preliminary, from Automobile Manufacturers' Association—Final figures from Bureau of the Census; [e] American Iron and Steel Institute; [f] National Association of Flat-Rolled Steel Manufacturers; [g] American Institute of Steel Construction; [h] United States Steel Corpn.; [hh] U. S. Engineer, Pittsburgh; [i] F. W. Dodge Corpn.; [k] *Railway Age;* [l] National Machine Tool Builders Association; [ll] Foundry Equipment Manufacturers Association; [m] Department of Commerce; [n] British Iron and Steel Federation; [o] American Bureau of Metal Statistics; [p] American Zinc Institute, Inc.; [r] New York Commodities Exchange.

Steel Demand Is Maintained and Output Rises Fractionally

Buying Broadens as to Sources But Is at Close Range—Freight Rate Increase Stimulates Pig Iron Shipments—Scrap Prices Hold

STEEL demand is well maintained and ingot output has risen one-half a point to 46½ per cent of capacity. Operations rose three points to 55 per cent in the Valleys and fell two points to 52 per cent in the Cleveland-Lorain district, remaining substantially unchanged in other producing areas. The gain in the national average is too small to indicate a change in trend, and the disposition of the trade is to express satisfaction with the manner in which business volume is holding up rather than to hazard predictions as to the future.

One reason for this cautious attitude is that buying is at extremely short range. While the emergency freight rate increase stimulated pig iron shipments, it had comparatively little effect on finished steel orders. Business is coming from a greater diversity of sources, but the permanence of this expansion is difficult to appraise, since the prospective requirements of numerous miscellaneous groups of consumers cannot be forecast in the way that the needs of the railroads, the motor car makers and the building industry can be anticipated.

THE automobile industry, though contributing less support to the mills than earlier in the year, is still a leading source of tonnage. In fact, at one producing center this week, releases of automotive steel increased, but whether or not this be significant, the flow of steel to the motor car trade promises to be in large volume throughout the current quarter. The "staying" power of retail demand for automobiles has been astonishing. Assemblies this month will total close to 475,000, May output is estimated at more than 400,000, and June production is provisionally placed at 325,000 units. If these forecasts, which are regarded as conservative, are borne out, the total for the first half of the year will equal that of the first six months of 1930, when 2,309,335 units were turned out.

Tin plate output continues to range from 80 to 85 per cent of capacity, and production of wire products has been raised to a strong 50 per cent by a marked expansion in demand for barbed wire, woven wire fencing and nails for rural consumption. Some departments of wire mills have been forced to operate 24 hr. a day to replenish exhausted stocks.

STRUCTURAL steel awards of 32,025 tons, the second largest this year, are swelled by 16,000 tons for a strip mill for a Michigan steel plant and by 5000 tons for spillway gates for the Fort Peck dam in Montana. Reinforcing bar lettings of 17,000 tons include 11,000 tons for the Montana dam project.

The Missouri Pacific has bought 9000 tons of rails and 8000 tons of track fastenings.

Demand for heavy rolled products in coming months will depend on the rapidity with which funds are put to work under the Emergency Relief Appropriation Act. The State of New York, which will be awarded $29,000,000 for highways, bridges, streets, etc., and $20,000,000 for grade separation work, has a complete program ready and should be able to advertise for bids on many projects in the near future.

PIG IRON shipments in April have shown a substantial gain over the first half of March. The increase for automotive foundries was 30 per cent and was mainly due to increased requirements. In the case of most other melters, however, the incentive for larger shipping orders was the advance in freight rates.

Confusion persists as to the extent of the increased freight charges because of doubt as to whether State regulatory bodies will sanction advances in intrastate rates. At present writing rates have not yet been advanced in 36 States. Another complication arises from the fact that the Interstate Commerce Commission's order failed to assess the emergency charge against carload rates established by the railroads to meet truck and water competition.

WHETHER producers or consumers of iron and steel will have to absorb the increased raw material costs resulting from the rate advances will not become apparent until prices for the third quarter are filed. In the case of ore the test will come sooner. The Ford Motor Co. has entered the market for 180,000 tons, and sellers of ore are reported to favor a price advance to cover higher freight costs.

The first appeal for exemption from the code provision barring construction of new raw steel capacity has been filed with NRA by the Northwestern Barb Wire Co., Sterling, Ill.

Scrap markets are quiescent and THE IRON AGE scrap index is unchanged at $10.42 a gross ton. The pig iron and finished steel composites are also unchanged at $17.90 a ton and 2.124c. a lb. respectively.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

Per Gross Ton:	Apr. 16, 1935	Apr. 9, 1935	Mar. 19, 1935	Apr. 17, 1934
No. 2 fdy., Philadelphia	$20.26	$20.26	$20.26	$19.26
No. 2, Valley furnace	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti	19.13	19.13	19.13	18.13
No. 2, Birmingham†	14.50	14.50	14.50	13.50
No. 2 foundry, Chicago*	18.50	18.50	18.50	17.50
Basic, del'd eastern Pa.	19.76	19.76	19.76	18.76
Basic, Valley furnace	18.00	18.00	18.00	17.00
Valley Bessemer, del'd P'gh.	20.76	20.76	20.76	19.76
Malleable, Chicago*	18.50	18.50	18.50	17.50
Malleable, Valley	18.50	18.50	18.50	17.50
L. S. charcoal, Chicago	24.04	24.04	24.04	24.04
Ferromanganese, seab'd carlots	85.00	85.00	85.00	85.00

†This quotation is for delivery in South; in the North prices are 38c. a ton under delivered quotations from nearest Northern furnace.
*The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$36.37½	$36.37½	$36.37½	$36.37½
Light rails, Pittsburgh	35.00	35.00	35.00	32.00
Rerolling billets, Pittsburgh	27.00	27.00	27.00	26.00
Sheet bars, Pittsburgh	28.00	28.00	28.00	26.00
Slabs, Pittsburgh	27.00	27.00	27.00	26.00
Forging billets, Pittsburgh	32.00	32.00	32.00	31.00
Wire rods, Pittsburgh	38.00	38.00	38.00	36.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.70	1.70	1.70	1.60

Finished Steel

Per Lb.:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.80	1.80	1.80	1.75
Bars, Chicago	1.85	1.85	1.85	1.80
Bars, Cleveland	1.85	1.85	1.85	1.80
Bars, New York	2.13	2.13	2.13	2.08
Plates, Pittsburgh	1.80	1.80	1.80	1.70
Plates, Chicago	1.85	1.85	1.85	1.75
Plates, New York	2.08	2.08	2.08	1.98
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.70
Structural shapes, Chicago	1.85	1.85	1.85	1.75
Structural shapes, New York	2.05¼	2.05¼	2.05¼	1.95¼
Cold-finished bars, Pittsburgh	*1.95*	2.10	2.10	2.10
Hot-rolled strips, Pittsburgh	1.85	1.85	1.85	1.75
Cold-rolled strips, Pittsburgh	2.60	2.60	2.60	2.40

Finished Steel

Per Lb.:	Apr. 16, 1935 Cents	Apr. 9, 1935 Cents	Mar. 19, 1935 Cents	Apr. 17, 1934 Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.40	2.40	2.40	2.25
Hot-rolled annealed sheets, No. 24, Gary	2.50	2.50	2.50	2.35
Sheets, galv., No. 24, P'gh	3.10	3.10	3.10	2.85
Sheets, galv., No. 24, Gary	3.20	3.20	3.20	2.95
Hot-rolled sheets, No. 10, P'gh	1.85	1.85	1.85	1.75
Hot-rolled sheets No. 10, Gary	1.95	1.95	1.95	1.85
Wire nails, Pittsburgh	2.60	2.60	2.60	2.35
Wire nails, Chicago dist. mill	2.65	2.65	2.65	2.40
Plain wire, Pittsburgh	2.30	2.30	2.30	2.20
Plain wire, Chicago dist. mill	2.35	2.35	2.35	2.25
Barbed wire, galv., Pittsburgh	3.00	3.00	3.00	2.85
Barbed wire, galv., Chicago dist. mill	3.05	3.05	3.05	2.90
Tin plate, 100 lb. box, P'gh.	$5.25	$5.25	$5.25	$5.25

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$11.50	$11.50	$12.00	$14.25
Heavy melting steel, Phila.	10.00	10.00	10.25	11.75
Heavy melting steel, Chicago	9.75	9.75	10.25	11.75
Carwheels, Chicago	10.50	10.50	11.00	11.75
Carwheels, Philadelphia	11.25	11.25	11.75	13.00
No. 1 cast, Pittsburgh	12.25	12.25	12.75	13.75
No. 1 cast, Philadelphia	11.00	11.00	11.00	13.25
No. 1 cast, Ch'go, (net ton)	9.00	9.00	9.50	9.50
No. 1 RR. wrot., Phila.	10.75	10.75	10.75	12.50
No. 1 RR. wrot., Ch'go, (net)	8.00	8.00	8.00	9.50

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.85	$3.85	$3.85	$3.85
Foundry coke, prompt	4.60	4.60	4.60	4.60

Metals

Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Electrolytic copper, refinery‡	8.75	8.75	8.75	8.75
Lake copper, New York‡	9.12½	9.12½	9.12½	8.50
Tin (Straits), New York	**51.12½**	49.25	45.50	55.50
Zinc, East St. Louis	**4.07½**	4.00	3.90	4.40
Zinc, New York	**4.42½**	4.35	4.25	4.75
Lead, St. Louis	**3.55**	3.50	3.45	4.10
Lead, New York	**3.70**	3.65	3.60	4.25
Antimony (Asiatic), N. Y.	14.25	14.25	14.50	7.95

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables. ‡Blue Eagle copper.

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
April 16, 1935	2.124c. a Lb.	$17.90 a Gross Ton	$10.42 a Gross Ton
One week ago	2.124c.	17.90	10.42
One month ago	2.124c.	17.90	10.83
One year ago	2.008c.	16.90	12.58
	Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strips. These products make 85 per cent of the United States output.	Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.	Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel HIGH	Finished Steel LOW	Pig Iron HIGH	Pig Iron LOW	Steel Scrap HIGH	Steel Scrap LOW
1935	2.124c., Jan. 8;	2.124c., Jan. 8	$17.90, Jan. 8;	$17.90, Jan. 8	$12.33, Jan. 8;	$10.42, April 9
1934	2.199c., April 24;	2.008c., Jan. 2	17.90, May 1;	16.90, Jan. 27	13.00, Mar. 13;	9.50, Sept. 25
1933	2.015c., Oct. 3;	1.867c., April 18	16.90, Dec. 5;	13.56, Jan. 3	12.25, Aug. 8;	6.75, Jan. 3
1932	1.977c., Oct. 4;	1.926c., Feb. 2	14.81, Jan. 5;	13.56, Dec. 6	8.50, Jan. 12;	6.42, July 5
1931	2.037c., Jan. 13;	1.945c., Dec. 29	15.90, Jan. 6;	14.79, Dec. 15	11.33, Jan. 6;	8.50, Dec. 29
1930	2.273c., Jan. 7;	2.018c., Dec. 9	18.21, Jan. 7;	15.90, Dec. 16	15.00, Feb. 18;	11.25, Dec. 9
1929	2.317c., April 2;	2.273c., Oct. 29	18.71, May 14;	18.21, Dec. 17	17.58, Jan. 29;	14.08, Dec. 3
1928	2.286c., Dec. 11;	2.217c., July 17	18.59, Nov. 27;	17.04, July 24	16.50, Dec. 31;	13.08, July 2
1927	2.402c., Jan. 4;	2.212c., Nov. 1	19.71, Jan. 4;	17.54, Nov. 1	15.25, Jan. 11;	13.08, Nov. 22

Demand Is Sustained in Pittsburgh District

Steel Output Unchanged Locally at 35 Per Cent and in Wheeling District at 77 Per Cent, While Valley Rate Is Up Three Points to 55 Per Cent

PITTSBURGH, April 16.—Demand for finished steel in this district is fairly steady. Aggregate bookings are in sustained volume, with miscellaneous tonnage the most impressive feature in the current market. It is difficult at the moment to foretell in what direction steel activity here is headed. The automotive industry continues to defy earlier predictions of steel sellers that large-scale buying would be necessary to sustain motor assembly schedules through the second quarter.

With the bulk of construction activity still supported almost entirely by public funds, construction projects probably will lag behind seasonal expectations and will not increase importantly until money is released from the Federal relief bill enacted last week. Steel requirements of the railroads upon which the Pittsburgh district depends a great deal offer no immediate encouragement to local mills.

At least one sustaining influence is found in the unusually heavy production of tin plate, which this week is unchanged at 80 to 85 per cent. Strip steel output is slightly higher, while sheet production is holding.

Confusion over the freight surcharges to be applied on interstate commerce beginning April 18 has obscured the probable effects on steel costs and selling prices. Although the increased freight charges on raw materials will unquestionably add additional burdens to the steel producer's lot, it is considered questionable whether the increased cost of steel making will be reflected in prices for third quarter.

Meanwhile raw steel output is virtually in step with finished steel demand. In the Pittsburgh district ingot production is holding at 35 per cent. Output in the Valleys and nearby northern Ohio mills has risen three points to 55 per cent, while in the Wheeling district activity is sustained at 77 per cent.

Pig Iron

The impending increased freight charges have not led to heavier buying, but have stimulated consumer interest in spot requirements. Large consumers taking barge deliveries are not concerned with increased rail charges, and the possibility of rulings by State transit commissions against I.C.C. surcharges on intrastate freight movement has minimized the importance of the freight situation in the immediate market picture. Pig iron producers in this district are faced with higher producing costs, but are prohibited by the code from passing them on to the consumer during the remainder of second quarter.

Semi-Finished Steel

Buying in this market is sustained on a moderate scale, with sheet bars and skelp in large demand. The largest movement continues to be in sheet bars for tin plate conversion. Detached mills are not burdened with heavy stocks of semi-finished grades, and continue to gage purchases more or less with trends in demand for finished steel.

Bolts, Nuts and Rivets

Specifications on second quarter contracts are appearing irregularly. A lack of railroad buying is the greatest check to current activity. Demand from jobbers is naturally light in view of the anticipatory buying at lower prices before the close of first quarter. The new prices apparently are being maintained without open breaks.

Rails and Track Accessories

Demand in this district continues at a minimum. The carriers' requirements reaching Pittsburgh producers embrace only materials for repair and maintenance work.

Reinforcing Steel

The number of small jobs taking reinforcing steel is increasing, but the increase in aggregate tonnage booked by mills here is scarcely noticeable. The Tri-State Authority, which is sponsoring a flood control plan in the Allegheny and Monongahela river basin expects to obtain funds for its program from the Federal Relief Works bill enacted last week. Thirteen dams on tributaries of the Allegheny and Monongahela rivers are included in the program and, if authorized, will probably require a substantial tonnage of reinforcing steel.

Cold Finished Bars

A slightly heavier flow of orders has appeared since April 11, when cold-finished bars were reduced $3 a ton. The present Pittsburgh base is 1.95c. a lb. The automotive industry is taking a fair share of the current movement, while farm implement makers still are important consumers. Jobbers have been covering more freely since the reduction in prices, but such replenishments have been in moderate volume.

Plates and Shapes

The impending freight increases have revived interest in new barge construction, but specific inquiry is restricted. The American Barge Line in Pittsburgh placed contracts for 18 tanks for three old barges, requiring about 368 tons, in lieu of purchasing new barges.

Formal contract has been awarded for the Great Lakes Steel Corpn. mill building at Ecorse, Mich., requiring about 16,000 tons of structural steel, to Fort Pitt Bridge Works Co., and Whitehead & Kales, Inc. Other awards reported for the past week were featureless. New structural work is appearing in small volume.

Tubular Products

Aggregate demand for tubing is steady. The most regular movement continues to be to the oil fields, whose requirements, however, have not fulfilled prospects earlier this year. The oil industry is not expected to expand its purchases of drill pipe, tubing and casing until its own affairs, as affected by Federal efforts to control the production of oil, are more definitely settled. Electric weld mechanical tubing is in fair demand for automotive consumption, with smaller quantities of seamless mechanical tubing moving to motor car centers.

Bars

The prospect of any reduction in the base price of merchant bars this quarter remains obscure, despite general pressure for lower prices from consuming quarters expecting a general readjustment following the reduction in cold-finished bars. Meanwhile, the volume of incoming tonnage is unchanged. Producers in this district as yet cannot report the expected bulge in automotive buying, which for some weeks has been repre-

sented as running well behind assembly schedules for the entire second quarter. Miscellaneous business is holding satisfactorily.

Wire Products

Demand for merchant wire has not reached its usual spring pace. Compared with demand for other forms of finished steel, however, activity in this market is considered satisfactory, with aggregate consuming requirements sufficient to support operations in this district at around 40 per cent. At one mill, production is running well ahead of the average, owing to stocking in anticipation of possible labor difficulties. Shipments to the automotive industry are fairly steady.

Tin Plate

Specifications against contracts are fewer, but backlogs of important producers still are sufficiently heavy to sustain aggregate output for the industry at 80 to 85 per cent. Shipments to consumers, however, are diminishing slightly, with a fair share of current production being stocked against releases for later shipment.

Warehouse Business

In view of the recent reduction in mill prices, leading warehouse companies have reduced quotations covering cold-finished and screw stock, rounds and hexagons, and squares and flats, to a single basis of 3.20c. for both city and country delivery. The former differential was 10c. a 100 lb. Shipments out of Pittsburgh warehouses have been in moderate volume for the past month. Competition on wire nails is severe.

Strip Steel

The volume of new incoming tonnage is fluctuating slightly, with automotive and miscellaneous specifications virtually on a parity in many instances. Hot-rolled strip production has risen moderately to slightly below 50 per cent, with cold-rolled schedules averaging about five points higher.

Sheets

Orders from motor car centers in the past week were in slightly heavier volume, while miscellaneous business maintained its recent pace. Shipments to farm implement and electric refrigerator manufacturers are notably well sustained. The jobbing trade is spotty, with movement of galvanized sheets not up to seasonal expectations. Sheet mill schedules this week will average 65 to 70 per cent. A slightly disturbing influence in this market has been a $2 reduction in galvanized roofing, gages Nos. 26, 28 and 29. The reduction originated in the South, which is the largest field for galvanized roofing, and followed the protests of jobbers in that district that the previous margin was too slim to permit profitable handling of this material.

Coal and Coke

With the emergency freight surcharge averaging only 15c. on freight rates in excess of $1.50 a net ton, fuel consumers have not been interested in covering in anticipation of the effective date of the higher freight charges. In fact, the heavy anticipatory stocking prior to the strike threat is believed to have placed most consumers in a comfortable position for at least the next month. In keeping with this condition, bituminous coal production and beehive coke output have slumped rather sharply since April 1.

Scrap

Activity is restricted largely to dealer covering against orders. Mill buying is at a minimum. Most scrap prices are temporarily resisting the absence of demand, and for the time being might be regarded as slightly firmer in view of the impending freight increases and also to the lack of small yard scrap offerings. A fair demand for low phosphorus grades continues to come from steel foundries. Low phosphorus billet crops are slightly higher. Scrap in the Youngstown market is weak, No. 1 heavy melting steel having been sold there at $11, delivered.

Boston Scrap Prices Unsettled

BOSTON, April 16.—Due to another slump in the movement of scrap to Pennsylvania consuming points, prices for such material have become more or less unsettled. The average price paid the past week for breakable cast was $5 a ton, f.o.b., off 10c. from the previous week's low price, and turnings, $1.25 a ton, off 5c., while cotton ties brought $5 a ton, off 5c. to 10c. In the export market the range of prices for material is unchanged, but inside quotations were made much more often than outside. A steamer is loading several thousand tons of scrap here for Genoa, Italy.

Some of the smaller users have been buying pig iron for quick shipment in anticipation of higher prices following April 18. Irons largely involved are Buffalo, Pennsylvania and Southern brands, but the aggregate tonnage is not large. Freight rates on Mystic pig iron from Everett to New Haven railroad points, which constitute the bulk of Mystic Iron Works shipments, will not be changed under the new schedule owing to the fact that such shipments come into competition with motor and water transportation rates. Rates from Everett to Boston & Albany and Boston & Maine railroad points, however, will be 7 per cent above the existing rates. It appears, therefore, that furnaces outside New England will have to absorb a 7 per cent freight rate increase on shipments to New Haven railroad points.

Pig Iron Demand Improves at Buffalo

BUFFALO, April 16.—Pig iron business has grown steadily better since April 1. Some of the added volume is no doubt due to the prospective increase in freight rates. Lots now being placed range from carloads to 500 and 1000 tons. Foundries continue to operate at a fairly good rate, showing little letup in activity.

Mill operations are practically the same, with the Lackawanna plant of Bethlehem Steel Corpn. running nine open-hearth furnaces and Wickwire-Spencer Steel Corpn., one, while the Seneca sheet division of Bethlehem is averaging about 80 per cent. Republic Steel Corpn. failed to shut down over last week-end as it had previously. It is operating three open-hearth furnaces.

A contract for 250 tons of structural steel for a new building for J. N. Adam & Co., a Buffalo department store, has been let to a Buffalo fabricator. A considerable volume of very small structural jobs have been let. Bids will be opened later this month for a 250-ton job for a State hospital at Rome, N. Y.

A sale of 2500 tons of old hydraulic compressed sheets to the principal Buffalo consumer is noted. The price was $7.50, which is the equivalent of $10 for No. 1 steel. However, little or no No. 1 is being shipped on this order. The mill is now offering $9.50 for No. 1 steel, but scrap men believe that no tonnage could be purchased for less than $10, or possibly more.

Operations Hold Steady at 50 Per Cent at Chicago

Automotive Demand Improves and Structural Business Is More Active—Railroad Equipment Builder Buys 10,000 Tons of Pig Iron

CHICAGO, April 16. — Better demand from the automobile industry, a broader spread of steel needs among miscellaneous consumers and the desire on the part of many users to take added tonnages ahead of the advance in freight rates have all served to hold ingot output steady at 50 per cent of capacity. The accelerated movement that resulted from the freight rate situation worked for the major part against old commitments in the form of specifications. Nevertheless new sales for the past week were the third best so far this year and compare favorably with the best weeks in 1934.

Purchase of 10,000 tons of basic pig iron by a railroad equipment builder seems to have great significance at the moment because the only real active equipment project at this time is the lot of 500 gondola cars that the Burlington will build in its own shops and for which it will use 500 tons of one of the new high-strength steels.

A Detroit fabricator has taken 16,000 tons of structural steel and reinforcing bars for the Fort Peck spillway and two shops are sharing in 16,000 tons of structural steel for a steel mill addition at Ecorse, Mich. Structural business is more active and there are a satisfying number of private jobs.

The scrap market remains listless, with consumers willing to take only small lots at a time. The Chicago & North Western is reported to be wrecking 5000 cars that it had offered for sale a month or more ago.

Wire mills are enjoying a bulge in spring trade that in some cases has wiped out producers' stocks and forced some departments, such as in various types of fencing, to operate 24 hr. a day.

Pig Iron

A railroad equipment manufacturer near St. Louis has placed orders for 10,000 tons of basic iron. This is rather an exceptional move at a time such as this and it does not reflect a drift in the minds of foundrymen. Shipments of pig iron are running at the rate of 10 per cent ahead of March.

Reinforcing Bars

New business is moving in fair volume and private enterprise is accounting for a substantial part of orders booked. Quotations for repair work and alterations are growing in number as the weather moderates. Plans for the superstructure of the Armour beef killing house are nearing completion and more sewer work will soon be up for figures at St. Paul, Minn. The filter plant at Milwaukee has been awarded to a general contractor who has placed the 3600 tons of reinforcing bars. All papers on this project are in the hands of the local legal department for review.

Cast Iron Pipe

Reports are persistent that prices are to be advanced, but word has not reached Chicago as to the amount of the rise or the time when it will take effect. Current bookings are confined to small lots, such as sewage treatment plants at Richmond and Indianapolis, Ind., and at Battle Creek, Mich., and a filter plant at Racine, Wis. There is a sizeable tonnage to come up at Chicago for the Sanitary District, but in all probability orders will not be placed for three or four months. The market is in a transitory period between disbursement of old PWA funds and the new money that recently has been appropriated by Congress.

Sheets

Some measure of new life is being added to the sheet market from a wide variety of sources. Automobile manufacturers are again buying and are a source of new support at a time when mills had expected production would be on the down grade. Container manufacturers are holding all the ground that they have gained, and roofers, though no longer the bellwether of the sheet market, are enjoying a spring trade that is encouraging. In addition there is a growing volume of miscellaneous business that clearly marks a rather slow but sure spread in general industrial activity. New orders do not yet equal shipments, but the margin has narrowed considerably since a week ago.

Wire Products

Sellers have now assembled total figures for the first quarter and it shows up as the best three months' period since 1929. New business is still flowing in and production has been pushed up to 50 per cent of capacity, where it is momentarily checked, partly because of difficulty in getting skilled labor to operate some departments full time. A number of departments are now being operated 24 hr. a day to take up slack caused by the drying up of stocks in the hands of producers. There is a particularly active demand for barbed wire and woven wire fencing, and nails are moving fast in rural areas. In fact, practically all lines handled by dealers are in unusually active demand. Among potential sources of business are the railroads, which will soon begin to benefit from freight rate increases.

Strip Steel

Small users are coming into the market in increasing numbers and some sellers report the return of old customers who have been out of the market for three to four years. Shipments to major consumers are holding to recent averages and output remains firmly entrenched at 55 per cent of capacity.

Plates

The Burlington has started to order materials for the 500 gondola cars that it will build in its own shops. These cars will be made in part of one of the new high-strength steels. Mills look hopefully to the freight rate advances as being the means of quickening the railroads' demands for steel products. A Chicago malting company will use 200 tons of plates for tanks.

Bars

Purchases by automobile manufacturers are fully one-third heavier than a week ago and releases by this important industry show no further decline. Recurring dust storms are still not more than a threat to the farm implement group, which is maintaining very satisfactory schedules. Miscellaneous use of bars has grown fast in recent weeks.

Structural Material

Structural awards, at over 21,000 tons, were given a substantial

boost by orders for 16,000 tons placed by the Great Lakes Steel Corpn., which will furnish to the fabricators about 8000 tons of the necessary steel. Fresh inquiries, at 8000 tons, include 2000 tons for the Wheeler dam in Alabama and a good sprinkling of small private projects.

Scrap

Mills continue to take small lots of heavy melting steel at $10 a gross ton delivered. A leading industrialist has disposed of cast iron borings at $4.75 a gross ton on track, while consumers pay in the range from $5 to $5.50. The trade expects freight advances to take effect April 18. Switching charges will go up 10 per cent. The one-line switching charge on a net ton basis will go up from 60 to 66c., the two-line haul from 70 to 77c. and the three-line haul from 80 to 88c. a net ton. Line hauls move up 7 per cent, with a maximum of 40c. allowed on the net ton basis.

Rails

A railroad serving the Central West has ordered 5000 tons of rails from four producers. Chicago mills now estimate that there is not more than 6000 tons of rails hanging over the market at this time. The aggregate of new orders for track supplies is 5000 tons.

Valley Mill Activity Improves—Intrastate Rates to Be Unchanged in Three States

YOUNGSTOWN, April 15.—Minor improvement in automotive steel buying, an undiminished flow of miscellaneous orders and a strong demand for tin plate are accounting for a moderate pick-up in Valley mill activity.

With stocks of ingots and semi-finished steel fairly sensitive to finished steel demand, producers are being forced occasionally to add open-hearths. Finishing mill schedules, however, have not been speeded up generally, as Valley steel makers are exercising caution in laying operating plans in the face of uncertain business prospects. Sheet, strip and tin plate mill operations are well sustained as a result of the preponderant demand for flat-rolled steel. Merchant bar and alloy bar production is considered satisfactory, but output of pipe and constructional steel is disappointingly small.

The recent small improvement in demand here is considered to be genuine, despite the impending freight surcharges to be applied after April 17. Steel consumers do not appear concerned on that score for the time being for at least two good reasons.

In the first place, all second quarter steel contracts that failed to include a clause providing for a higher delivered basis in the event of increased freight tariffs protect the consumer from additional charges until June 30, the steel producer being obliged to absorb the surcharge. Moreover, a great deal of confusion has been caused by the announcement by at least three State transportation regulating bodies that the decision of the Interstate Commerce Commission will not be applied to intrastate freight movement until the State commissions have heard the protests of shippers. Unofficially, one carrier has refused to follow the ICC ruling and may not increase its rates to include the emergency surcharge.

Depending upon the outcome of present discussion, therefore, the ordering of steel in the meantime is not being influenced greatly by additional freight costs.

Steel producers in the Valleys are confronted with the prospect of adding several million dollars in the next year to producing costs as a result of the freight increases. It is considered questionable whether the additional cost of making steel will be reflected in finished steel prices for third quarter. The expiration of the present code in June also is a moot point of all discussions relating to the course of steel in the next few months.

Pig iron consumers are proving to be more concerned than are steel buyers over the freight surcharges and are releasing shipments against contracts with considerably more freedom than current melting requirements would warrant. New buying of virgin iron, however, continues on a small scale.

The scrap market appears to be ignoring either the improvement in the steel market or the prospects of higher freight rates becoming effective this week. Prices have weakened in the past fortnight. No. 1 heavy melting steel has been sold in round lots at $11 a ton, delivered mill, representing a drop of $1 a ton from the quotation two weeks ago. No. 2 steel and compressed sheets likewise are soft, at around $10.25, delivered. Valley mills are not laying in scrap at present.

Large Public Projects Feature Coast Activity

SAN FRANCISCO, April 15.—Major tonnages are included in several projects in the San Francisco area on which bids will be opened during the week. Contract specifications for the San Francisco-Oakland bridge distribution structure call for 2250 tons of structural steel, 2000 tons of reinforcing bars and 330 tons of pipe railing. A wharf extension at Oakland, Cal., will require approximately 700 tons of reinforcing bars. At Denver, Colo., bids are being opened April 24 for the construction of the Cherry Creek retarding dam near Sullivan. The city will furnish 1296 tons of steel sheet piling, 462 tons of bars, 26 tons of shapes and other material.

The award of 3200 tons of plates to Southwest Welding & Mfg. Co. by the Los Angeles Department of Water and Power was the outstanding booking of the past week. Mississippi Valley Structural Steel Co. is reported to have taken 750 tons of 1400 tons of structural steel on which bids have been taken at Phoenix, Ariz., by the Maricopa County Water Conservation District. Bids were also received on 1052 tons of rails and 485 tons of reinforcing bars included in the project. Truscon Steel Co. booked approximately 700 tons of bars to be used in the Marina Junior high school at San Francisco.

The California Pacific International Exposition to be held during the summer at San Diego, Cal., will require fair steel tonnages. Approximately 600 tons of structural steel and 500 tons of reinforcing bars are included in general contracts that have been awarded. Revised plans and specifications for the completion of San Gabriel dam, near Los Angeles, call for the further expenditure of $11,743,310. Although figures are not available it is understood that several thousand tons of steel are yet to be purchased. At San Francisco bids for the Francis Scott Key school will include 350 tons of reinforcing bars and an unannounced structural tonnage.

A decrease of $3 a ton on cold-finished bars became effective during the past week but there were no indications of other mill price changes.

Steel Bookings Remain Below March Level at New York

Freight Rate Increase Fails to Stimulate Releases—New York State Public Works Program Is Ready to Go Ahead

NEW YORK, April 16. — The impending increase in freight rates has failed to stimulate the movement of finished steel, although it is reported to have resulted in heavier pig iron shipments. Though mills, under the code, quote delivered prices, they insert clauses in their contracts, in most cases, protecting themselves against freight rate advances. Even outstanding bids against identified construction projects will be revised to include the higher freight charges. However, in the case of contracts already closed for identified projects the mills will be required to absorb the increased transportation charges on the steel that has not yet been delivered.

Considerable confusion will arise if, as is now reported, various State regulatory bodies refuse to allow advances in intrastate rates in keeping with the increases granted by the Interstate Commerce Commission. Among the perplexing problems will be the ascertainment of delivered prices for commodities shipped from a mill to a consumer within the same State though the price basing point is in another State. In the case of sheets, for example, a shipment might move from Middletown to another point in Ohio and yet the basing point would be Pittsburgh. Assuming that intrastate rates are not advanced in Ohio, would delivered prices take the new rate from Pittsburgh to destination or the old one?

Finished steel bookings in this district are not keeping pace with those of March. The recession in business, however, has been gradual and might quickly be offset by the award of various pending major construction tonnages. Tin plate releases remain in satisfactory volume and stainless steel demand is still active.

Under the Federal works relief act the State of New York will be awarded $29,000,000 for highways, bridges, streets, etc., and $20,000,000 for grade separation work. New Jersey will receive $8,000,000 for highways and $6,000,000 for grade elimination. New York has a complete program ready and should be able to advertise for bids on many jobs in the near future.

Small apartment house construction is on the increase in the metropolitan area, but a large part of the steel bought for this work is of foreign origin or is second hand material. One fabricator in this territory recently purchased 5000 tons of steel taken from the Chicago world's fair.

Railroad purchases are currently confined to maintenance requirements. The Board of Transportation, New York, is expected to issue an inquiry in June for 500 cars for the independent subway system. The Soviet Government is in the market for 20 locomotives. The Texas Co. is expected to issue an inquiry for 3000 tons for plates for a solvent unit at Port Arthur, Tex.

Pig Iron

Last week was marked by a moderate increase in activity as a result of the pending increase in rail rates. Larger users ordered out more freely on standing contracts, and a few of the smaller melters purchased somewhat heavier than immediate requirements necessitated. However, the greater proportion of foundries prefer to absorb the slightly higher cost rather than build up inventories in the face of current poor prospects for second quarter business. Sales for the week amounted to 2600 tons, as compared with 1250 tons in the preceding period and 1900 tons booked two weeks ago. The emergency tariffs will go into effect on April 18. Not only must users of pig iron absorb increases varying up to 44.8c. a gross ton, but furnaces also must absorb an increase due to advances on raw products. This higher assembly cost has been figured as a maximum of 47c. for the entire country. The higher cost to furnaces in eastern Pennsylvania is somewhat lower, being around 35c. a gross ton. For some time Eastern producers of pig iron have been pressing Washington for a ban on foreign importations. The President has definitely set aside this petition, and Dutch, Indian and perhaps Russian iron will continue to supply a good portion of this district's requirements.

Reinforcing Steel

Miscellaneous small-lot demand for bars is picking up somewhat but wire mesh continues exceptionally quiet. At the present time there is no project involving over 100 tons up for bidding, but distributers are looking forward to heavier public works expenditures early in May.

Scrap

Even with lower prices prevailing, dealers are releasing heavier quantities of materials to export brokers. However, this condition is unfortunate at the moment inasmuch as there is a definite shortage of boats. Local brokers have fairly heavy accumulations of materials on their hands. Export buying prices for No. 1 and No. 2 steels have been dropped to $8.50 and $7 a ton respectively, alongside barge. Unprepared yard iron and steel is down to $4, No. 2 cast is now $6.25, and several other grades are 25c. to 50c. a ton lower. In addition to heavy outstanding Italian commitments, there is yet about 250,000 tons of heavy steel to be shipped to Japan by June. About one-half of this Japanese tonnage will come from the New York-Philadelphia district. At the present time almost 40,000 tons has accumulated at New York and Philadelphia awaiting boats, but this tonnage will probably not be entirely shipped for at least a month.

Gain in Pig Iron Shipments at Detroit

DETROIT, April 16.—Pig iron shipments to automotive foundries in first half of April were 30 per cent greater than in first half of March. Only in one case were purchases in anticipation of higher freight rates, most of the iron being for immediate use.

The Detroit scrap market remains quiet, with consumers showing slight interest in placing orders. Prices are unchanged. Production of scrap by the automotive industry continues heavy. Ford is laying down large quantities of old material in its yards at the Rouge plant.

Eastern Pennsylvania Rate Holds at 32 Per Cent

Steel Institute Cautions Sellers of Deep Drawing Sheets — Emergency Freight Rates Lift Pig Iron Cost by About 47¢

PHILADELPHIA, April 16.—Several of the smaller mills in this district are eating into ingot inventories to some extent and may be forced to start additional furnaces for short runs in the near future. However, the general backlog of the district is so low as to preclude any significant increase in operating rate in the near future. Bethlehem is operating slightly better, and Pencoyd has both structural mills on with four furnaces melting steel. Nevertheless, the operating rate for the district as a whole shows no change from last week, being still at 32 per cent of capacity.

Steel sellers here have notified all customers regarding the emergency freight increases, effective after April 18. However there is still some confusion regarding exceptions to the emergency tariffs. No charge will be assessed in connection with carload rates established to meet truck or water competition, where these rates have been so indicated in existing tariff schedules. However the railroads seem to have little knowledge as to what points will benefit from this exemption. Likewise, there is confusion as to whether emergency tariffs are to apply on intrastate commerce. They will in Pennsylvania, but there are 36 States which have yet not filed decisions on intrastate traffic.

Although a large percentage of sheets sold is for drawing purposes, many sellers have made it a practice not to charge extras for such sheets even when the seller assumed the "hazard of breakage." The steel code authority has just cautioned all mills that this practice must cease or code violation will be charged. The drawing extras for cold-rolled, hot-rolled and hot-rolled annealed sheets are 15c. for No. 12 gage or heavier, 25c. for Nos. 13 to 21 gage, and 35c. for No. 22 gage and lighter.

Pig Iron

This market is again a day-to-day affair with buying confined mostly to carloads. The somewhat heavier releases of last week have served to stock larger users for at least a month, and sellers are currently forced to subsist on the uncertain demand of steel and iron foundries The emergency tariff rates effective on April 18 will lift the cost of making iron by about 47c. a ton, according to several furnace operators. This rise apparently eliminates the possibility of a general price decrease for third quarter. Agitation on the part of eastern furnaces for higher tariffs on foreign iron has been definitely set aside by the President. Consequently the flow of Dutch and Indian iron into this territory will continue.

Sheets and Strip

Hot-rolled strip continues in fair demand, but cold-rolled material is less active, with manufacturers of ball bearing races the principal takers. Users of full-finished sheets are drawing on old contracts and are purchasing fresh material very sparingly. Consumer demands for blue-annealed sheets are still spotty and in light volume. There are no indications at the present time that either sheets or strip will show any improvement over the remainder of the quarter.

Bars, Plates and Shapes

Bids go in this week on 140 tons of shapes for a Lakehurst, N. J., storehouse, and 175 tons for an addition to a Philadelphia warehouse of the Reading Railroad. Belmont Iron Works will furnish 270 tons for St. Mary's Hospital at Philadelphia, and Norris Iron & Wire Co. has been awarded 125 tons for a mill building near Philadelphia for E. J. Lavino & Co. The reinforcing steel market continues inactive. Demand for plates is currently very slow although there has been a slight increase in prospective tonnage. The Sun Shipbuilding Co. is expected soon to let the various requirements of the Erie ferryboat, and this same company will probably secure the contract for two Gulf Oil Co. tankers. This latter project will require between 8000 and 10,000 tons of plates. The Pennsylvania Railroad is now purchasing plate and floor plate requirements for 100 cement cars being rebuilt at Altoona, Pa.

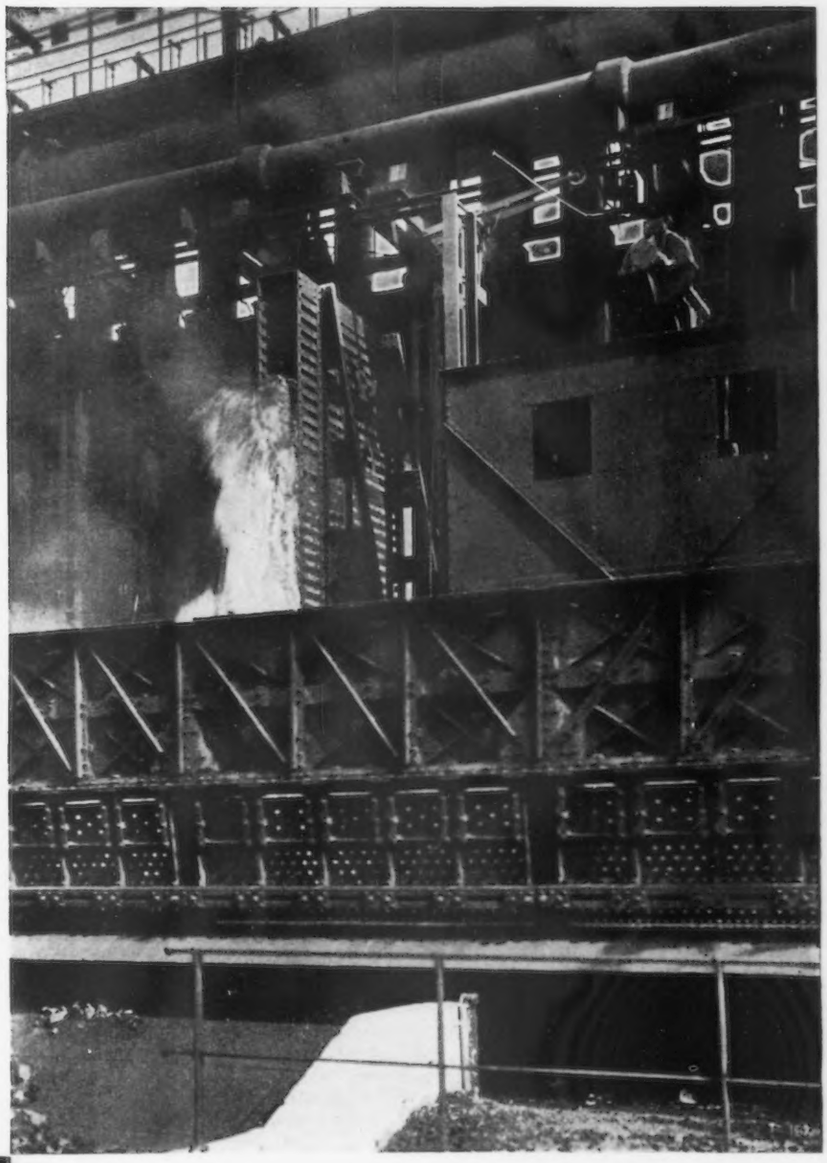
Imports

The following iron and steel imports were received here last week: 488 tons of chrome ore from South Africa; 350 tons of pig iron from British India; 104 tons of sponge iron, 32 tons of steel tubes and 2 tons of steel bars from Sweden; 29 tons of manganese ore from Dutch East Indies; 16 tons of the same product and 5 tons of steel sheets from Germany, and 1 ton of ferrotitanium from England.

Scrap

The domestic market for No. 1 steel continues at $10, as no mill has bought above this level nor has any broker indicated a desire to sell a large tonnage at a lower price. No. 2 steel continues nominally at $9 even though one nearby user is accepting delivery on an old contract for $9.50. Oddly enough, the market here shows no sign of serious weakness even though buying for export is practically at a standstill. The strengthening factors are the possibility of domestic mills finding it necessary to rebuild scrap inventories and the knowledge that export buying will again become active as soon as boats are available to liquidate present accumulations at Port Richmond. A number of Japanese boats are now in South America taking care of agricultural exports, but scrap exporters along the eastern seaboard of this country expect an adequate number of boats during May. Heavy cast grades continue to move from this territory into domestic consumption at Harrisburg, Pa. Demand for cupola scrap is slow, but there has been no serious price reaction.

The Carnegie Institute of Technology, Pittsburgh, announces that there will be available for the coming academic year two teaching assistantships and one fellowship in the graduate department of metallurgy. These may be held by candidates for advanced degrees. Candidates should communicate immediately, addressing their communications to Prof. O. T. Geckeler, secretary of the Committee on Graduate Instruction, Carnegie Institute of Technology, Pittsburgh.



KOPPERS OFFERS

Becker Type Oven Plants
Gas Producers
Water Gas Plants
Liquid Purification Plants
By-Product Equipment
Material Handling Plants
Phenol Removal Plants
Benzol Plants

When Koppers By-Product Coke Oven Plants or equipment supplement or replace existing equipment, they bring new vigor to the entire coke and gas producing operation. Whether the addition consists of Becker Ovens, By-Product apparatus, or Material Handling apparatus, its relation to the customers' equipment and business is carefully developed in accordance with sound modern practice.

The result is a unified, re-vitalized plant that makes possible new records in production and efficiency.

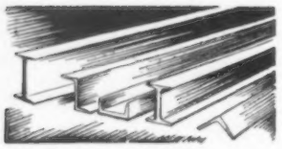
Our engineers will be glad to help you consider the installation of Koppers Plants and Equipment for your gas and coke requirements.

KOPPERS

CONSTRUCTION

Pittsburgh • Penna • COMPANY

Steel Demand Holds Up Well at Cleveland



Ingot Output Is Off Two Points to 52 Per Cent But Aggregate Bookings Show Little Recession—Ford Inquires for Ore

CLEVELAND, April 16.—Demand for finished steel is holding up well. The volume of business during the first half of April with several of the leading mills was equal to that during the corresponding period of March, although there was some falling off in tonnage for a few of the mills producing only sheets and strip steel.

Ingot output in the Cleveland-Lorain territory declined two points during the week to 52 per cent of capacity, a local plant taking off one open-hearth furnace. There has been some curtailment of sheet mill operations. Sheets continue to move in good volume to automobile manufacturers, and there was a gain in both sheet and strip steel business during the week from some of the automobile parts manufacturers due to releases for parts for Ford and Chevrolet cars.

Miscellaneous demand for finished steel is broad and fairly satisfactory. Some new tonnage in sheets in sizeable lots has come from the refrigerator industry, and business is holding up well with makers of other household equipment. Government orders for trucks have stimulated releases of sheets for truck bodies. Activity in the construction field remains light. However, a rush in work is expected when funds made available by the Federal works relief bill are allocated.

The only inquiry in the railroad field is for approximately 15,000 tons of rails for the Erie Railroad, which are expected to be placed about May 1. The only apparent effect of the advance in freight rates April 18 is some stimulation in pig iron shipments to consuming points having rather high freight rates.

Pig Iron

Shipping orders so far this month have been slightly larger than during the corresponding period of March. Sales are lighter. One Lake furnace interest sold 2000 tons as compared with 5000 tons the previous week. New business is confined to small lots from miscellaneous consumers. The advance in freight rates has stimulated shipping orders only from foundries located at considerable distance from basing points that will feel the effect of the increase in rates more than those nearer basing points and having lower freight rates.

Iron Ore

An inquiry for 180,000 tons of ore from the Ford Motor Co. was received by ore firms today. This inquiry is for 120,000 of basic ore and 60,000 tons of high-phosphorus ore. This is the first open market ore inquiry for the season. Ore shippers have been awaiting the Ford inquiry, which is usually the first to come out before taking any action in respect to prices for the season. The prices to be established will be named in quotations to the Ford company, which probably will be submitted within a week or two. Before the advance in freight rates there was little expectation of a change in ore prices. However, sentiment in the iron ore industry is rather strongly in favor of passing along to the consumers the 11.2c. per gross ton advance in the freight rate which will apply on this season's shipments. Producers feel that they cannot absorb the increased freight charge, which would be equivalent to a reduction by that amount in the price of ore.

Sheets

New buying took a spurt during the week from some of the stamping plants in this territory making automobile parts. Orders include a good tonnage for running boards for Ford automobiles. A leading refrigerator manufacturer also placed a large order. Government agencies have placed large orders for dump bodies for trucks with Ohio body manufacturers, and these are buying sizeable lots of sheets in 12 and 14-gage material for making the bodies. New demand for enameling sheets continues active. Ohio sheet mills are still getting considerable business from automobile companies in the Detroit territory, but the latter's purchases are not in as large lots as a few weeks ago.

Strip Steel

Demand, which has been quiet for some time, became more active the past week. Some of the leading manufacturers of automobile parts placed fair-sized orders for both hot and cold-rolled strip, largely for Chevrolet parts. Business outside of the motor car field is very light.

Bolts and Nuts

Demand from the motor car and agricultural implement industries is holding up well. The leading local manufacturer reports that its sales and shipments during the first half of April were slightly heavier than during the corresponding period of March. The new price of 70, 10 and 5 per cent discount is being well maintained.

Bars, Plates and Shapes

Demand for bars from the automotive industry, including local forge shops, and from agricultural implement manufacturers is well sustained. Manufacturers of road scrapers are getting busier and orders from this source have increased. Activity in the construction field remains very light. A great deal of grade elimination and railroad bridge work is in prospect awaiting the granting of funds from the Federal works relief appropriation. A new Government inquiry is out in connection with the Muskingum district conservation project. This is for the Beach City dam, which will take 588 tons of reinforcing bars.

Scrap

Prices on nearly all grades have declined 25c. to 50c. a ton, and the market is weak at present levels. Cast scrap is down 50c. a ton. The supply of scrap is in excess of the present demand, which is limited to coverage by dealers against outstanding orders. As low as $9 is being offered for No. 1 heavy melting steel. A firmer market tone is not looked for until there is renewed buying by consumers. In the Valley district No. 1 heavy melting steel has declined to $11.

The Bureau of Supplies and Accounts, Navy Department, will open bids April 26 for approximately 100 tons of rivets for the cruiser Honolulu being built at the Brooklyn navy yard.

Week's Zinc Sales Highest Since 1930; Spelter, Lead and Tin Quotations Rise

Scarcity of Prompt Metal at New York Forces Tin Prices Here Above London Level—Copper Market Dull with Sales Below March Average

NEW YORK, April 16.—The copper market has become quite a dull affair, especially when compared with the other metals. Sales are still averaging better than 1000 tons daily, but bookings to date this month are behind the corresponding March total. Consumption seems to be fairly well maintained, but outstanding users are still out of the market in most instances. The Blue Eagle price is unchanged at 9c. a lb., delivered Connecticut Valley, and talk of an immediate advance has largely subsided. The foreign market is also less active and the recent price advance has apparently been checked. Electrolytic copper was quoted in London this morning at 7.70c. a lb., usual Continental base ports.

Tin

A scarcity of prompt available metal forced tin prices up sharply last week, the New York market having advanced more than 1c. a lb. in a single day. While the London market has also advanced moderately, it has hardly kept pace with the local exchange. The tight situation at New York has eased slightly in the last two days, but some grades of prompt tin are still not available. No important buying movement is apparent as the price increase has been brought about on small transactions. The market today was quotable at 51.12½c. a lb. on prompt metal and has regained all the ground lost in the recent price decline. At London this morning standard tin was quotable at £226 15s. for spot and £223 for futures. Straits metal was available at £233 15s., while the market in the East was £232 7s. 6d.

Lead

Recent consistent demand for lead resulted in a $1 a ton advance in prices yesterday, and the market is now quotable at 3.55c. a lb., St. Louis, and 3.70c., New York. The St. Joseph Lead Co. is maintaining its usual $1 a ton differential in the East. Demand for lead is well diversified and no single consuming interest is outstanding. Shipments this month have been very heavy because of the freight rate advance scheduled for April 18, and it is believed that this will be reflected in very favorable statistics for the month.

Zinc

With spelter prices advancing steadily and now quotable $7 to $8 a ton above the recent low, sales last week amounted to 12,000 tons and were the largest for any week since January, 1930. In the preceding comparable period 4000 tons was sold, although transactions this week are not so heavy. After having been established at 4c. a lb., East St. Louis, early last week, the market was steady until Fiday when another $1 a ton advance was announced. Yesterday, a number of sellers were asking still another $1 and a price of 4.10c. will probably be established tomorrow. However, the 4.05c. figure had not entirely disappeared this morning and today's price must be quoted at a range of 4.05c. to 4.10c. with the usual differential prevailing for New York. The Prime Western Zinc Producers Committee of the American Zinc Institute, Inc., reported sales of 5020 tons of Prime Western during March for delivery that month at an average weighted price of 3.886c. a lb., East St. Louis. March sales for subsequent delivery were 5244 tons at 3.875c. a lb. The Joplin ore market is unchanged.

Ingot Brass and Bronze

The code authority for the ingot brass and bronze industry reports that member companies shipped or delivered 4959 tons of ingot brass and bronze during February.

The Week's Prices. Cents Per Pound for Early Delivery

	April 10	April 11	April 12	April 13	April 15	April 16
Electrolytic copper, N. Y.*	8.75	8.75	8.75	8.75	8.75	8.75
Lake Copper, N. Y.	9.12½	9.12½	9.12½	9.12½	9.12½	9.12½
Straits tin, Spot, New York	49.55	51.00	51.25	....	51.00	51.12½
Zinc, East St. Louis	4.00	4.00	4.02½	4.05	4.07½	4.07½
Zinc, New York	4.35	4.35	4.37½	4.40	4.42½	4.42½
Lead, St. Louis	3.50	3.50	3.50	3.50	3.55	3.55
Lead, New York	3.65	3.65	3.65	3.65	3.70	3.70

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, virgin 99 per cent plus, 19c. to 22c. a lb., delivered.
Aluminum, remelt No. 12 (alloy), carload lots delivered, 14c. a lb., average for week.
Nickel, electrolytic, 35c. to 36c. a lb. base at refinery in lots of 2 tons or more.
Antimony, 14.25c. a lb., New York.
Brass ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	52.00c. to 53.00c.
Tin, bar	54.00c. to 55.00c.
Copper, Lake	10.25c. to 11.00c.
Copper, electrolytic	10.00c. to 10.50c.
Copper, castings	9.75c. to 10.75c.
*Copper sheets, hot-rolled	16.00c.
*High brass sheets	14.25c.
*Seamless brass tubes	16.00c.
*Seamless copper tubes	16.25c.
*Brass rods	12.75c.
Zinc, slabs	5.75c. to 6.75c.
Zinc, sheets (No. 9), casks, 1200 lb. and over	10.25c.
Lead, American pig	4.50c. to 5.50c.
Lead, bar	5.50c. to 6.50c.
Lead, sheets	7.25c.
Antimony, Asiatic	15.50c. to 16.50c.
Alum., virgin, 99 per cent, plus	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent	18.00c. to 19.00c.
Solder, ½ and ½	30.00c. to 31.00c.
Babbitt metal, commercial grades	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	55.00c.
Tin, bar	57.00c.
Copper, Lake	10.00c.
Copper, electrolytic	10.00c.
Copper, castings	9.75c.
Zinc, slabs	5.50c. to 5.75c.
Lead, American pig	4.50c. to 4.75c.
Lead, bar	7.75c.
Antimony, Asiatic	16.50c.
Babbitt metal, medium grade	18.50c.
Babbitt metal, high grade	56.75c.
Solder, ½ and ½	31.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	5.87½c.	6.62½c.
Copper, hvy. and wire	5.75c.	6.25c.
Copper, light and bottoms	4.75c.	5.25c.
Brass, heavy	3.12½c.	3.75c.
Brass, light	2.37½c.	3.12½c.
Hvy. machine composition	4.62½c.	5.12½c.
No. 1 yel. brass turnings	4.12½c.	4.62½c.
No. 1 red brass or compos. turnings	4.37½c.	4.87½c.
Lead, heavy	2.62½c.	3.00c.
Zinc	2.00c.	2.37½c.
Cast aluminum	10.12½c.	11.25c.
Sheet aluminum	11.50c.	13.00c.

Prices of Finished Steel and Iron Products

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel	*Base per Lb.*
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
F.o.b. Duluth	1.95c.
Del'd Detroit	1.95c.
F.o.b. Cleveland	1.85c.
F.o.b. Buffalo	1.90c.
Del'd Philadelphia	2.09c.
Del'd New York	2.13c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Rail Steel

(For merchant trade)

F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Gary	1.75c.
F.o.b. Moline, Ill.	1.75c.
F.o.b. Cleveland	1.75c.
F.o.b. Buffalo	1.80c.
F.o.b. Birmingham	1.85c.
F.o.b. cars dock Gulf ports	2.10c.
F.o.b. cars dock Pacific ports	2.25c.

Billet Steel Reinforcing

(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	2.05c.
F.o.b. Chicago	2.10c.
F.o.b. Gary	2.10c.
Del'd Detroit	2.20c.
F.o.b. Cleveland	2.10c.
F.o.b. Youngstown	2.10c.
F.o.b. Buffalo	2.10c.
F.o.b. Birmingham	2.10c.
F.o.b. cars dock Gulf ports	2.45c.
F.o.b. cars dock Pacific ports	2.45c.

Rail Steel Reinforcing

(Straight lengths as quoted by distributers)

F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago	1.95c.
F.o.b. Gary	1.95c.
F.o.b. Cleveland	1.95c.
F.o.b. Youngstown	1.95c.
F.o.b. Buffalo	1.95c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.30c.
F.o.b. cars dock Pacific ports	2.30c.

Iron

F.o.b. Chicago	1.80c.
F.o.b. Terre Haute, Ind.	1.75c.
F.o.b. Louisville, Ky.	2.10c.
F.o.b. Dansville, Pa.	1.80c.
F.o.b. Berwick, Pa.	1.70c.

Cold Finished Bars and Shafting*

	Base per Lb.
F.o.b. Pittsburgh	1.95c.
F.o.b. Chicago	2.00c.
F.o.b. Gary	2.00c.
F.o.b. Cleveland	2.00c.
F.o.b. Buffalo	2.05c.
Del'd Detroit	2.15c.
Del'd eastern Michigan	2.20c.

* In quantities of 10,000 to 19,000 lb.

Fence and Sign Posts

Angle Line Posts	*Base per Net Ton*
F.o.b. Pittsburgh	$50.00
F.o.b. Chicago	50.00
F.o.b. Duluth	51.00
F.o.b. Cleveland	50.00
F.o.b. Birmingham	53.00
F.o.b. Houston, Orange, Beaumont, Galveston	59.00
F.o.b. Mobile	58.00
F.o.b. New Orleans, Lake Charles, Corpus Christi	59.00
F.o.b. cars dock Pacific ports	63.00

Plates

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
F.o.b. Gary	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Coatesville	1.90c.
F.o.b. Sparrows Point	1.90c.
Del'd Philadelphia	1.985c.
Del'd New York	2.08c.
F.o.b. Birmingham	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.
Wrought iron plates, f.o.b. P'gh	3.20c.

Floor Plates

F.o.b. Pittsburgh	3.35c.
F.o.b. Chicago	3.40c.
F.o.b. Coatesville	3.45c.
F.o.b. cars dock Gulf ports	3.75c.
F.o.b. cars dock Pacific ports	3.90c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh	1.80c.
F.o.b. Chicago	1.85c.
Del'd Cleveland	1.985c.
F.o.b. Buffalo	1.90c.
F.o.b. Bethlehem	1.90c.
Del'd Philadelphia	2.005c.
Del'd New York	2.0525c.
F.o.b. Birmingham (standard)	1.95c.
F.o.b. cars dock Gulf ports	2.20c.
F.o.b. cars dock Pacific ports	2.35c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	2.15c.
F.o.b. Chicago	2.25c.
F.o.b. Buffalo	2.25c.
F.o.b. cars dock Gulf ports	2.60c.
F.o.b. cars dock Pacific ports	2.60c.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets

Hot Rolled

	Base per Lb.
No. 10, f.o.b. Pittsburgh	1.85c.
No. 10, f.o.b. Gary	1.95c.
No. 10, del'd Detroit	2.05c.
No. 10, del'd Phila.	2.14c.
No. 10, f.o.b. Birmingham	2.00c.
No. 10, f.o.b. dock cars Pacific ports	2.40c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.40c.
No. 24, f.o.b. Gary	2.50c.
No. 24, del'd Detroit	2.60c.
No. 24, del'd Phila.	2.69c.
No. 24, f.o.b. Birmingham	2.55c.
No. 24, f.o.b. dock cars Pacific ports	3.05c.
No. 24, wrought iron, Pittsburgh	4.30c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.50c.
No. 10 gage, f.o.b. Gary	2.60c.
No. 10 gage, del'd Detroit	2.70c.
No. 10 gage, del'd Phila.	2.79c.
No. 10 gage, f.o.b. Birmingham	2.65c.
No. 10 gage, f.o.b. dock cars Pacific ports	3.10c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.95c.
No. 20 gage, f.o.b. Gary	3.05c.
No. 20 gage, del'd Detroit	3.15c.
No. 20 gage, del'd Phila.	3.24c.
No. 20 gage, f.o.b. Birmingham	
No. 20 gage, f.o.b. Birmingham	3.10c.
No. 24, f.o.b. dock cars Pacific ports	3.50c.

Galvanized Sheets

No. 24, gage, f.o.b. Pittsburgh	3.10c.
No. 24, f.o.b. Gary	3.20c.
No. 24, del'd Phila.	3.39c.
No. 24, f.o.b. Birmingham	3.25c.
No. 24, f.o.b. dock cars Pacific ports	3.70c.
No. 24, wrought iron, Pittsburgh	4.95c.

Long Ternes

No. 24, unassorted 8-lb. coating f.o.b. Pittsburgh	3.40c.
F.o.b. cars dock Pacific ports	4.10c.

Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.75c.
No. 28, Gary	2.85c.
No. 28, cars dock, Pacific Coast ports	3.35c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mill	$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.50

Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ In.

	Base per Lb.
All widths up to 24 in., P'gh	1.85c.
All widths up to 24 in., Chicago	1.95c.
All widths up to 24 in., del'd Detroit	2.05c.
All widths up to 24 in., Birmingham	2.00c.
Cooperage stock, Pittsburgh	2.10c.
Cooperage stock, Chicago	2.20c.

Cold-Rolled Strips

	Base per Lb.
F.o.b. Pittsburgh	2.60c.
F.o.b. Cleveland	2.60c.
Del'd Chicago	2.88c.
F.o.b. Worcester	2.80c.

Fender Stock

No. 14, Pittsburgh or Cleveland	2.90c.
No. 14, Worcester	3.30c.
No. 20, Pittsburgh or Cleveland	3.30c.
No. 20, Worcester	3.70c.

Hot-Rolled Rail Steel Strips

	Base per Lb.
F.o.b. Pittsburgh	1.70c.
F.o.b. Chicago	1.75c.
F.o.b. Birmingham	1.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	*Per Lb.*
Bright wire	2.30c.
Spring wire	2.90c.

Chicago prices on products sold to the manufacturing trade are $1 a ton above Pittsburgh or Cleveland. Worcester and Duluth prices are $2 a ton above, Birmingham $3 above, and Pacific Coast prices $9 a ton above Pittsburgh or Cleveland.

To Jobbing Trade

Qualified jobbers are entitled to a reduction of 20c. a 100 lb. from the base price on carload shipments to stock, and of 10c. a 100 lb. on less-carload shipments to stock.

	Base per Keg
Standard wire nails	$2.60
Smooth coated nails	2.60
Galvanized nails:	
15 gage and coarser	4.60
16 gage and finer	5.10

	Base per 100 Lb.
Annealed fence wire	$2.45
Galvanized fence wire	2.80
Polished staples	3.30
Galvanized staples	3.55
Barbed wire, galvanized	3.00
Woven wire fence, base column	63.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is $2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are $2 a ton over Pittsburgh (except for woven wire fence at Duluth which is $3 over Pittsburgh), and Birmingham mill prices are $3 a ton over Pittsburgh.

On wire nails, barbed wire, staples and fence wire, prices at Houston, Galveston and Corpus Christi, Tex., New Orleans, Lake Charles, La., and Mobile, Ala., are $6 a ton over Pittsburgh, while Pacific Coast prices are $8 over Pittsburgh. Exception: on fence wire Pacific Coast prices are $11 a ton above Pittsburgh.

On staples and barbed wire, prices of $6 a ton above Pittsburgh are also quoted at Beaumont and Orange, Tex.

Wire Hoops, Twisted or Welded

	Off List
F.o.b. Pittsburgh	35 and 2½ off
F.o.b. Chicago	35 off

STEEL AND WROUGHT PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio Mills

F.o.b. Pittsburgh only on wrought iron pipe

Butt Weld

Steel Inches	Black	Galv.
⅛	51½	29½
¼ to ⅜	53½	35
½	58½	47
¾	62	52
1 to 3	64	55

Wrought Iron Inches	Black	Galv.
⅛	+9	1½+13
¼ & ⅜	+1	1½+21½
½	31	15
¾	36	20½
1 & 1¼	39	25½
1½	43	28
2	41	26

Lap Weld

2	60	51
2½ to 3	63	54
3½ to 6	65	56
7 and 8	64	54
9 and 10	63½	53½
11 and 12	62½	52½

2	37	22½
2½ to 3½	38	25
4 to 8	40	28½
9 to 12	38	24½

Butt Weld, extra strong, plain ends

⅛	48½	33½
¼ to ⅜	51	38
½	56½	47½
¾	61	52
1 to 3	63	55

⅛	+13	+45½
¼ & ⅜	+2	½+34½
½	32½	17½
¾	37½	23½
1 to 2	43½	29

Lap Weld, extra strong, plain ends

2	58	50
2½ to 3	62	54
3½ to 6	65½	57½
7 and 8	64½	54½
9 and 10	63½	53½
11 and 12	62½	52½

2	40	26
2½ to 4	45½	33
4½ to 6	43	33½
7 & 8	46	33
9 to 12	41½	30

On standard steel pipe an extra 5% off is allowed on sales to consumers while two 5's off apply on sales to jobbers. On less-than-carload shipments prices are determined by adding 20 and 25% and the carload freight rate to the base card. On structural steel pipe the base card is reduced 2 points and two 5's off are allowed to consumers and three 5's off to jobbers.

Note—Chicago district mills have a base two points less than the above discounts Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Seamless Steel Commercial Boiler Tubes and Locomotive Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

		Cold Drawn	Hot Rolled
1 in. o.d.	13 B.W.G.	$ 8.60	$7.52
1¼ in. o.d.	13 B.W.G.	10.19	9.26
1½ in. o.d.	13 B.W.G.	11.26	10.23
1¾ in. o.d.	13 B.W.G.	12.81	11.64
2 in. o.d.	13 B.W.G.	14.35	13.04
2¼ in. o.d.	13 B.W.G.	16.00	14.54
2½ in. o.d.	12 B.W.G.	19.29	17.54
2¾ in. o.d.	12 B.W.G.	20.45	18.59
3 in. o.d.	12 B.W.G.	21.45	19.50
4½ in. o.d.	10 B.W.G.	41.08	37.35
3½ in. o.d.	11 B.W.G.	27.09	24.62
4 in. o.d.	10 B.W.G.	33.60	30.54
4½ in. o.d.	10 B.W.G.	41.08	37.35
5 in. o.d.	9 B.W.G.	51.56	46.87
6 in. o.d.	7 B.W.G.	79.15	71.96

Extras for less-carload quantities:
25,000 lb. or ft. to 39,999 lb. or ft. 5 %
10,000 lb or ft to 24,999 lb. or ft. 12½ %
2,000 lb. or ft. to 9,999 lb. or ft. 25 %
Under 2,000 lb. or ft. 40 %

Hot-Finished Lapweld Steel Pressure Tubes

(Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots)

1½ in. o.d.	13 B.W.G.	$ 9.72
1¾ in. o.d.	13 B.W.G.	11.06
2 in. o.d.	13 B.W.G.	12.38
2¼ in. o.d.	13 B.W.G.	13.79
2½ in. o.d.	12 B.W.G.	16.58
2¾ in. o.d.	12 B.W.G.	17.54
3 in.o.d.	12 B.W.G.	18.35
3¼ in. o.d.	11 B.W.G.	21.50
3½ in. o.d.	11 B.W.G.	23.15
4 in. o.d.	10 B.W.G.	28.61
4½ in. o.d.	10 B.W.G.	35.22
5 in. o.d.	9 B.W.G.	44.25
6 in. o.d.	7 B.W.G.	68.11

Quantity Extras:
40,000 lb. or ft. base
25,000 lb. or ft. to 39,999 lb. or ft. plus 5%
10,000 lb. or ft. to 24,999 lb. or ft. plus 12½%
2,000 lb. or ft. to 9,999 lb. or ft. plus 25%
Under 2,000 lb. or ft. plus 40%

CHARCOAL IRON BOILER TUBES

Base Discounts, f.o.b. Pittsburgh

In. O. D.	
1½ and 1¾	44
2 —2¼	13 and 10
2½—2¾	16 and 10
3	17 and 10
3¼—3½	18 and 10
4	20 and 10
4½, 5, 6	21 and 10

Extras for quantity: For 1½ to 1¾ in. 8 points under 10,000 lb., up 4 points 10,000 lb. to carload. For 2 in. to 3¾ in., up 2 points without supplementary 10 per cent, under 10,000 lb.; supplementary 5 per cent instead of supplementary 10 per cent for 10,000 lb. to carload.

In sizes 2 in. to 4½ in. O.D. inclusive all tubes more than four gages heavier than standard are priced per lb. as follows: Carload and over, 9c.; extras for quantity—under 10,000 lb. 1c. per lb., 10,000 lb. to carload ½c. per lb.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$47.00
4-in., del'd Chicago	50.00
6-in. and larger, del'd New York	42.00
4-in. del'd New York	48.00
6-in. and larger, Birmingham	39.00
4-in. Birmingham	42.00

Class "A" and gas pipe, $3 extra.
*Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $38, Birmingham, and $46, delivered Chicago, and 4-in pipe $41, Birmingham, and $49 a ton, delivered Chicago.

RAILROAD MATERIALS

Rails and Track Supplies

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$36.37½
Angle bars, per 100 lb.	2.55

F.o.b. Code Basing Points

Light rails (from billets) per. gross ton	$35.00
Light rails (from rail steel) per gross ton	34.00

	Base per 100 Lbs.
Spikes, 9/16 in. and larger	$2.40
Spikes, ½ in. and smaller	2.60
Spikes, boat and barge	2.60
Tie plates steel	1.90
Tie plates, Pacific Coast ports	2.00
Track bolts, to steam railroads	3.25
Track bolts, no jobbers, all sizes (per 100 count)	70 per cent off list

Basing points on light rails are Pittsburgh Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Buffalo, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnesota, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa.; on spikes alone, Cleveland, Youngstown, Lebanon, Pa., Columbia, Pa., Richmond, Va., Jersey City, N. J.

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine bolts .....70, 10 and 5
Carriage bolts .....70, 10 and 5
Lag bolts .....70, 10 and 5
Plow bolts, Nos. 1, 2, 3 and 7 heads .....70, 10 and 5
Hot-pressed nuts, blank or tapped, square .....70, 10 and 5
Hot-pressed nuts, blank or tapped, hexagons .....70, 10 and 5
C.p.c. and t. square or hex. nuts, blank or tapped .....70, 10 and 5
Semi-finished hexagon nuts, U.S.S., all sizes .....70, 10 and 5
Semi-finished hexagon nuts, S.A.E. ¼ in. to 7/16 in. diameter..70, 10 and 5
½ in. to 1 in. diameter....70, 10 and 5
larger than 1 in. diameter..70, 10 and 5
Stove bolts in packages, Pittsburgh.. 75
Stove bolts in packages, Chicago.... 75
Stove bolts in packages, Cleveland.... 75
Stove bolts in bulk, Pittsburgh..... 83
Stove bolts in bulk, Chicago..... 83
Stove bolts in bulk, Cleveland..... 83
Tire bolts .....60 and 5

Large Rivets

(½-in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh or Cleveland.....$2.90
F.o.b. Chicago 3.00
F.o.b. Birmingham 3.05

Small Rivets

(7/16-in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh .....70 and 5
F.o.b. Cleveland .....70 and 5
F.o.b. Chicago and Birm'g'm....70 and 5

Cap and Set Screws

(Freight allowed up to but not exceeding 65c. per 100 lb. on lots of 200 lb. or more)

Per Cent Off List

Milled cap screws, 1 in. dia. and smaller .....80, 10 and 10
Milled standard set screws, case hardened, 1 in. dia. and smaller....75
Milled headless set screws, cut thread ¾ in. and smaller 75
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller 85
Upset set screw, cut and oval point 75 and 10 to 80
Milled studs .....65 to 65 and 10

Alloy and Stainless Steel

Alloy Steel Ingots

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Unecropped .....$40 per gross ton

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, $49 a gross ton.

Alloy Steel Bars

Price del'd Detroit is $52.

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base .....2.45c.
Delivered price at Detroit is.....2.60c.

S.A.E. Series Numbers	Alloy Differential per 100 lb.
2000 (1¼% Nickel)	$0.25
2100 (2¼% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.70
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is 25c. per lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2¼ in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 2.95c. base per lb.

STAINLESS STEEL No. 302

(17 to 19% Cr, 7 to 9% Ni, 0.08 to 0.20% C.)

(Base Prices, f.o.b. Pittsburgh)

Per Lb.

Forging billets .....19.55c.
Rerolling slabs ..... 15c.
Bars ..... 23c.
Plates ..... 26c.
Structural shapes ..... 23c.
Sheets ..... 33c.
Hot-rolled strip .....20¾c.
Cold-rolled strip ..... 27c.
Drawn wire ..... 23c.

Raw and Semi-Finished Steel

Carbon Steel Rerolling Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.
Uncropped .....$29 per gross ton

Carbon Steel Forging Ingots

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Birmingham.
Uncropped ....$31 per gross ton

Billets, Blooms and Slabs

F.o.b. Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham.

Per Gross Ton

Rerolling $27.00
Forging quality 32.00

Delivered Detroit

Rerolling $30.00
Forging 35.00

Billets Only F.o.b. Duluth

Rerolling $29.00
Forging 34.00

Sheet Bars

F.o.b. Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton

Open-hearth or Bessemer $28.00

Skelp

F.o.b. Pittsburgh, Chicago, Youngstown, Buffalo, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved ..... 1.70c.
Universal ..... 1.70c.
Sheared ..... 1.70c.

Tube Rounds

Base per Lb.

F.o.b. Pittsburgh ..... 1.80c.
F.o.b. Chicago ..... 1.85c.
F.o.b. Cleveland ..... 1.85c.
F.o.b. Buffalo ..... 1.90c.
F.o.b. Birmingham ..... 1.95c.

Wire Rods

(Common, base)

Per Gross Ton

F.o.b. Pittsburgh $38.00
F.o.b. Cleveland 38.00
F.o.b. Chicago 39.00
F.o.b. Anderson, Ind. 39.00
F.o.b. Youngstown 39.00
F.o.b. Worcester, Mass. 40.00
F.o.b. Birmingham 41.00
F.o.b. San Francisco 47.000
F.o.b. Galveston 44.00

Pig Iron and Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	$19.50	$20.00	$19.00	$20.50
Bethlehem, Pa.	19.50	20.00	19.00	20.50
Birdsboro, Pa.	19.50	20.00	19.00	20.50
Swedeland, Pa.	19.50	20.00	19.00	20.50
Steelton, Pa.	....	....	19.00	....
Sparrows Point, Md.	19.50	....	19.00	....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Youngstown	18.50	18.50	18.00	19.00
Buffalo	18.50	19.00	17.50	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Cleveland	18.50	18.50	18.00	19.00
Toledo, Ohio	18.50	18.50	18.00	19.00
Jackson, Ohio	20.25	20.25	19.75	....
Detroit	18.50	18.50	18.00	19.00
Hamilton, Ohio	18.50	18.50	18.00	19.00
Chicago	18.50	18.50	18.00	19.00
Granite City, Ill.	18.50	18.50	18.00	....
Duluth, Minn.	19.00	19.00	....	19.50
Birmingham	14.50	14.50	13.50	19.00
Provo, Utah	17.50	....	17.00	....

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District From Everett, Mass.	$20.00	$20.50	$19.50	$21.00
Brooklyn From East. Pa. or Buffalo	21.77	22.27	21.27	22.77
Newark or Jersey City, N. J. From East. Pa. or Buffalo	20.89	21.39	20.39	21.89
Philadelphia From Eastern Pa.	20.26	20.76	19.76	21.26
Cincinnati From Hamilton, Ohio	19.51	19.51	19.01	20.01
Canton, Ohio From Cleveland and Youngstown	19.76	19.76	19.26	20.26
Columbus, Ohio From Hamilton, Ohio	20.50	20.50	....	....
Mansfield, Ohio From Cleveland and Toledo..	20.26	20.26	....	....
Indianapolis From Hamilton, Ohio	20.77	20.77	....	....
South Bend, Ind. From Chicago	20.55	20.55	....	....
Milwaukee From Chicago	19.50	19.50	....	....
St. Paul From Duluth	20.94	....	....	....
Davenport, Iowa From Chicago	20.26	20.26	....	....
Kansas City From Garnite City	21.04	21.04	....	....

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.....$23.50

GRAY FORGE PIG IRON

Valley furnace $18.00
Pittsburgh district furnace 18.00

CHARCOAL PIG IRON

Lake Superior furnace $21.00
Delivered Chicago 24.04
Delivered Buffalo 24.36

CANADA

Pig Iron

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75.....$21.00
No. 2 fdy., sil. 1.75 to 2.75..... 20.50
Malleable 21.00

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75.....$22.50
No. 2 fdy., sil. 1.75 to 2.25..... 22.00
Malleable 22.50
Basic 22.00

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) $85.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21% $26.00

Electric Ferrosilicon

Per Gross Ton Delivered

50% (carloads) $77.50
50% (ton lots) 85.00
75% (carloads 126.00
75% (ton lots) 136.00

Silvery Iron

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
6%	$22.75	12%	$29.25
7%	23.75	13%	30.75
8%	24.75	14%	32.25
9%	25.75	15%	33.75
10%	26.75	16%	35.25
11%	27.75	17%	36.75

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Bessemer Ferrosilicon

F.o.b. Jackson, Ohio, Furnace

Per Gross Ton		*Per Gross Ton*	
10%	$27.75	14%	$33.25
11%	28.75	15%	34.75
12%	30.25	16%	36.25
13%	31.75	17%	37.75

Manganese 1½ to 3%, $1 a ton additional. For each unit of manganese over 3%, $1 a ton additional. Phosphorus 0.75% or over, $1 ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Other Ferroalloys

Ferrotungsten, per lb. contained W. del., carloads .....$1.35 to $1.45
Ferrotungsten, less carloads. 1.45 to 1.55
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr. per lb. contained Cr. delivered, in carloads ..... 10.00c.
Ferrochromium, 2% carbon ..... 16.50c. to 17.00c.
Ferrochromium, 1% carbon ..... 17.50c. to 18.00c.
Ferrochromium, 0.10% carbon ..... 19.50c. to 20.00c.
Ferrochromium, 0.06% carbon ..... 20.00c. to 20.50c.
Ferrovanadium, del. per lb. contained V. .....$2.70 to $2.90
Ferrocarbontitanium, 15 to 18% Ti, 6 to 8% C, f.o.b. furnace carload and contract per net ton.$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton with $2 unitage 50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage 65.00
Ferromolybdenum, per lb. Mo., del. 95c.
Calcium molybdate, per lb. Mo., del. ..... 80c.
Silico spiegel, per ton, f.o.b. furnace, car lots $38.00
Ton lots or less per ton 45.50
Silico-manganese, gross ton, delivered:
2.50% carbon grade 90.00
2% carbon grade 95.00
1% carbon grade 105.00
Spot prices .....$5 a ton higher

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$11.25 to $11.75
No. 2 heavy melting steel	10.25 to 10.75
No. 2 railroad wrought	11.25 to 11.75
Scrap rails	11.50 to 12.00
Rails, 3 ft. and under	12.75 to 13.25
Compressed sheet steel	11.00 to 11.50
Hand bundled sheet steel	10.00 to 10.50
Hvy. steel axle turnings	10.00 to 10.50
Machine shop turnings	7.50 to 8.00
Short shov. turnings	7.50 to 8.00
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
Cast iron carwheels	12.00 to 12.50
Heavy breakable cast	11.00 to 11.50
No. 1 cast	12.00 to 12.50
Railr. knuckles and couplers	14.00 to 14.50
Rail, coil and leaf springs	14.00 to 14.50
Rolled steel wheels	14.00 to 14.50
Low phos. billet crops	14.50 to 15.00
Low phos. sheet bar crops	14.25 to 14.75
Low phos. plate scrap	14.00 to 14.50
Low phos. punchings	14.00 to 14.50
Steel car axles	14.25 to 14.75

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$9.50 to $10.00
Automobile hvy. melt. steel	9.00 to 9.50
Shoveling steel	9.50 to 10.00
Hydraulic comp. sheets	8.50 to 9.00
Drop forge flashings	8.00 to 8.50
No. 1 busheling	8.25 to 8.75
Rolled carwheels	10.50 to 11.00
Railroad tires	11.50 to 12.00
Railroad leaf springs	10.50 to 11.00
Axle turnings	9.00 to 9.50
Steel couplers and knuckles	11.00 to 11.50
Coil springs	12.00 to 12.50
Axle turnings (elec. fur.)	9.50 to 10.00
Low phos. punchings	12.00 to 12.50
Low phos. plates, 12 in. and under	12.00 to 12.50
Cast iron borings	5.00 to 5.50
Short shoveling turnings	5.00 to 5.50
Machine shop turnings	5.00 to 5.50
Rerolling rails	11.00 to 11.50
Steel rails, less than 3 ft.	12.00 to 12.50
Steel rails, less than 2 ft.	12.50 to 13.00
Angle bars, steel	11.25 to 11.75
Cast iron carwheels	10.50 to 11.00
Railroad malleable	12.50 to 13.00
Agricultural malleable	9.50 to 10.00

	Per Net Ton
Iron car axles	$13.50 to $14.00
Steel car axles	13.50 to 14.00
No. 1 railroad wrought	8.00 to 8.50
No. 2 railroad wrought	8.50 to 9.00
No. 2 busheling	4.50 to 5.00
Locomotive tires, smooth	10.00 to 10.50
Pipe and flues	5.00 to 5.50
No. 1 machinery cast	9.00 to 9.50
Clean automobile cast	8.50 to 9.00
No. 1 railroad cast	8.00 to 8.50
No. 1 agricultural cast	8.00 to 8.50
Stove plate	5.00 to 5.50
Grate bars	5.50 to 6.00
Brake shoes	6.00 to 6.50

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$10.00
No. 2 heavy melting steel	9.00
No. 1 railroad wrought	$10.50 to 11.00
Bundled sheets	9.50 to 10.00
Hydraulic compressed, new	9.00 to 9.50
Hydraulic compressed, old	6.50 to 7.00
Machine shop turnings	5.50 to 6.00
Heavy axle turnings	8.50 to 9.00
Cast borings	5.00 to 5.50
Stove plate (steel works)	8.00 to 8.25
Heavy breakable cast	10.00 to 10.50
No. 1 low phos. heavy	14.50 to 15.00
Couplers and knuckles	13.50 to 14.00
Rolled steel wheels	13.50 to 14.00
No. 1 blast furnace	5.00 to 5.50
Spec. iron and steel pipe	8.00 to 8.50
Shafting	17.00 to 17.50
Steel axles	16.00
No. 1 forge fire	9.50 to 10.00
Cast iron carwheels	11.00 to 11.50
No. 1 cast	11.00
Cast borings (chem.)	12.00 to 14.00
Steel rails for rolling	12.00 to 12.50

CINCINNATI

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$7.50 to $8.00
No. 2 heavy melting steel	6.00 to 6.50
Scrap rails for melting	7.50 to 8.00
Loose sheet clippings	4.00 to 4.50
Bundled sheets	5.50 to 6.00
Cast iron borings	4.00 to 4.50
Machine shop turnings	4.00 to 4.50
No. 1 busheling	5.50 to 6.00
No. 2 busheling	2.25 to 2.75
Rails for rolling	8.50 to 9.00
No. 1 locomotive tires	6.75 to 7.25
Short rails	11.00 to 11.50
Cast iron carwheels	7.50 to 8.00
No. 1 machinery cast	8.75 to 9.25
No. 1 railroad cast	8.00 to 8.50
Burnt cast	5.50 to 6.00
Stove plate	5.50 to 6.00
Agricultural malleable	7.50 to 8.00
Railroad malleable	8.50 to 9.00

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$9.25 to $9.75
No. 2 heavy melting steel	8.75 to 9.25
Compressed sheet steel	8.75 to 9.25
Light bundled sheet stampings	7.00 to 7.50
Drop forge flashings	8.00 to 8.50
Machine shop turnings	5.00 to 5.50
Short shoveling turnings	6.00 to 6.50
No. 1 busheling	8.50 to 9.00
Steel axle turnings	8.50 to 9.00
Low phos. billet crops	14.00 to 14.50
Cast iron borings	6.25 to 6.75
Mixed borings and short turnings	6.25 to 6.75
No. 2 busheling	6.25 to 6.75
No. 1 cast	11.50 to 12.00
Railroad grate bars	7.00 to 7.50
Stove plate	7.25 to 7.75
Rails under 3 ft.	14.00 to 14.50
Rails for rolling	15.50 to 18.00
Railroad malleable	13.00 to 13.50
Cast iron carwheels	10.75 to 11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$10.00
No. 2 heavy melting scrap	8.50
Scrap rails	11.00
New hydraul. comp. sheets	8.50
Old hydraul. comp. sheets	7.50
Drop forge flashings	8.50
No. 1 busheling	$8.50 to 9.00
Hvy. steel axle turnings	8.00 to 8.50
Machine shop turnings	4.50 to 5.00
Knuckles and couplers	11.50 to 12.00
Coil and leaf springs	11.50 to 12.00
Rolled steel wheels	11.50 to 12.00
Low phos. billet crops	12.00 to 12.50
Short shov. steel turnings	6.00 to 6.50
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
No. 2 busheling	6.00 to 6.50
Steel car axles	11.50 to 12.00
Iron axles	11.50 to 12.00
No. 1 machinery cast	11.00 to 11.50
No. 1 cupola cast	10.00 to 10.50
Stove plate	9.00 to 9.50
Steel rails, 3 ft. and under	12.50 to 13.00
Cast iron carwheels	11.00 to 11.50
Industrial malleable	12.00 to 13.00
Railroad malleable	12.00 to 13.00
Chemical borings	8.00 to 8.50

BOSTON

Dealers' buying prices per gross ton:

*No. 1 heavy melting steel	$8.25 to $8.50
No. 1 heavy mieting steel	5.50 to 6.00
*Scrap T rails	8.25 to 8.50
*No. 2 steel	7.25 to 7.50
No. 2 steel	5.00 to 5.50
Breakable cast	5.00 to 5.25
Machine shop turnings	1.25 to 1.75
Bundled skeleton, long	4.75 to 5.00
Forge flashings	4.75 to 5.00
Mixed borings and turnings	1.00 to 1.50
Shafting	12.00 to 12.50
Steel car axles	11.50 to 12.00
Cast iron borings, chemical	6.50 to 7.00
Stove plate	4.00 to 4.25

Per gross ton delivered consumers' yards:

Textile cast	$9.00 to $9.50
No. 1 machinery cast	9.00 to 9.50
Stove plate	6.00 to 6.50
Railroad malleable	11.00 to 11.50

* Delivered local army base.

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	*$8.00 to *$8.50
No. 2 heavy melting steel	*7.00 to *7.00
Heavy breakable cast	6.00 to 6.25
No. 1 machinery cast	7.00 to 7.50
No. 2 cast	6.25
Stove plate	6.25
Steel car axles	13.50 to 14.00
No. 1 railroad wrought	7.00 to 7.50
No. 1 yard wrought, long	6.00 to 6.50
Spec. iron and steel pipe	4.50 to 5.00
Forge fire	5.50 to 6.00
Rails for rolling	8.50 to 9.00
Short shoveling turnings	1.75 to 2.00
Machine shop turnings	2.00 to 2.50
Cast borings	3.50 to 3.75
No. 1 blast furnace	2.00 to 2.50
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and steel	4.00

Per gross ton, delivered local foundries:

No. 1 machinery cast	$10.00
No. 1 hvy. cast (cupola size)	9.00
No. 2 cast	7.50

* For direct car loading only.
† Loading on barge.

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$9.00 to $9.50
Scrap steel rails	10.00 to 10.50
Short shoveling turnings	7.00
Stove plates	7.00
Steel axles	11.50
Iron axles	11.50
No. 1 railroad wrought	7.00
Rails for rolling	12.50
No. 1 cast	9.50 to 10.00
Tramcar wheels	10.00

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$8.50 to $9.00
No. 1 heavy melting	8.00 to 8.50
No. 2 heavy melting	7.00 to 7.50
No. 1 locomotive tires	9.75 to 10.25
Misc. stand-sec. rails	9.25 to 9.50
Railroad springs	9.50 to 10.00
Bundled sheets	6.00 to 6.50
No. 2 railroad wrought	8.00 to 8.50
No. 1 busheling	5.00 to 5.50
Cast iron borings and shoveling turnings	3.00 to 3.50
Rails for rolling	10.00 to 10.50
Machine shop turnings	2.75 to 3.25
Heavy turnings	5.50 to 6.00
Steel car axles	12.50 to 13.00
Iron car axles	15.00 to 16.00
No. 1 railroad wrought	6.00 to 6.50
Steel rails less than 3 ft.	11.50 to 12.00
Steel angle bars	9.50 to 10.00
Cast iron carwheels	7.00 to 7.50
No. 1 machinery cast	8.50 to 9.00
Railroad malleable	9.50 to 10.00
No. 1 railroad cast	8.00 to 8.50
Stove plate	6.50 to 7.00
Agricult. malleable	8.50 to 9.00

DETROIT

Dealers' buying prices per gross ton:

Heavy melting steel	$7.50 to $8.00
Borings and short turnings	4.00 to 4.50
Long turnings	$3.50 to $4.00
No. 1 machinery cast	10.25 to 10.75
Automotive cast	10.75 to 11.25
Hydraul. comp. sheets	7.50 to 8.00
Stove plate	6.50 to 7.00
New factory busheling	6.50 to 7.00
Old No. 2 busheling	3.75 to 4.25
Sheet clippings	4.50 to 5.00
Flashings	6.75 to 7.25
Low phos. plate scrap	7.50 to 8.00

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$7.00	$7.00
Rails scrap	8.00	8.00
Machine shop turnings	3.00	3.00
Boiler plate	4.50	4.50
Heavy axle turnings	4.50	4.00
Cast borings	4.00	3.50
Steel borings	2.00	2.00
Wrought pipe	3.50	3.50
Steel axles	7.00	8.00
Axles, wrought iron	7.00	8.00
No. 1 machinery cast	9.00	9.00
Stove plate	5.50	5.00
Standard carwheels	7.25	7.00
Malleable	6.75	7.00

ORES, FLUORSPAR, COKE, FUEL, REFRACTORIES

Lake Superior Ores

Delivered Lower Lake Ports

	Per Gross Ton
Old range, Bessemer, 51.50% iron	$4.80
Old range, non-Bessemer, 51.50% iron	4.65
Mesabi, Bessemer, 51.50% iron	4.65
Mesabi, non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore

C.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algeria	9.50c.
Iron, low phos., Swedish, average 68½% iron	9.50c.
Iron, basic or foundry, Swedish, aver. 65% iron	9c.
Iron, basic or foundry, Russian, aver. 65% iron	9c.
Manganese, Caucasian, washed 52%	26c.
Manganese, African, Indian, 44-48%	21c.
Manganese, African, Indian, 49-51%	24c.
Manganese, Brazilian, 46 to 48½%	20c.

	Per Net Ton Unit
Tungsten, Chinese, wolframite, duty paid, delivered*	$17.50 to $18.50
Tungsten, domestic, scheelite, delivered†	17.00

	Per Gross Ton
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic Seaboard	$17.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic Seaboard	20.00

* Quotations nominal in absence of sales.
† Nominal; no supplies available.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines for all-rail shipment	$13.00
Same grade for Ohio River barge shipment for Kentucky and Illinois River landings	16.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	14.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	19.00
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville Prompt	$3.85
Foundry, f.o.b. Connellsville Prompt	$4.60 to 5.10
Foundry, by-product, Chicago ovens, for delivery outside switching district	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	11.00
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	$9.35
Foundry, Birmingham	6.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry, by-product, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.80 to $2.05
Mine run coking coal, f.o.b. W. Pa.	2.05 to 2.25
Gas coal, ¾-in., f.o.b. Pa. mines	2.25 to 2.55
Mine run gas coal, f.o.b. Pa. mines	2.05 to 2.45
Steam slack, f.o.b. W. Pa. mines	1.55 to 1.65
Gas slack, f.o.b. W. Pa. mines	1.90 to 2.10

Fuel Oil

	Per Gal.
Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.88c.
No. 5 industrial fuel oil	3.38c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.50c.
No. 4 industrial	5.25c.
No. 5 industrial	4.25c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works: High-heat Duty Brick	Intermediate Duty Brick
Pennsylvania	$45.00	$40.00
Maryland	45.00	40.00
New Jersey	55.00	45.00
Ohio	45.00	40.00
Kentucky	45.00	40.00
Missouri	45.00	40.00
Illinois	45.00	40.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$45.00
Chicago District	50.00
Birmingham	55.00
Silica clay, per net ton	8.00

Chrome Brick

	Per Net Ton
Standard, f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	$45.00
Chemically Bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	42.50

Magnesite Brick

	Per Net Ton
Standard, f.o.b. Baltimore and Chester, Pa.	$65.00
Chemically Bonded, f.o.b. Baltimore	55.00

Grain Magnesite

	Per Net Ton
Imported, f.o.b. Baltimore and Chester, Pa.	$45.00
Domestic, f.o.b. Baltimore and Chester	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

Warehouse Prices for Steel Products

PITTSBURGH

Base per Lb.

Plates ..... 3.15c.
Structural shapes ..... 3.15c.
Soft steel bars and small shapes... 2.90c.
Reinforcing steel bars ..... 2.90c.
Cold-finished and screw stock:
Rounds and hexagons ..... 3.20c.
Squares and flats ..... 3.20c.
Hoops and bands under ¼ in..... 3.20c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles ..... 3.30c.
Galv. sheets (No. 24), 25 or more bundles ..... 3.95c.
Hot-rolled sheets (No. 10)..... 2.95c.
Galv. corrug. sheets (No. 28), per square (more than 3750 lb.)..... $3.69
Spikes, large ..... 2.90c.
Track bolts, all sizes, per 100 count, 65 per cent off list.
Machine bolts, 100 counts, 65 per cent off list.
Carriage bolts, 100 count, 65 per cent off list.
Nuts, all styles, 100 count, 65 per cent off list.
Large rivets, base per 100 lb.....$3.50
Wire, black, soft ann'l'd, base per 100 lb. *2.70
Wire, galv. soft, base per 100 lb...*2.925
Common wire nails, per keg.....*2.834
Cement coated nails, per keg.....*2.834

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applies to orders of 400 to 9999 lb.

*Delivered in Pittsburgh switching district.

CHICAGO

Base per Lb.

Plates and structural shapes..... 3.20c.
Soft steel bars ..... 2.95c.
Cold-fin. steel bars:
Rounds and hexagons ..... 3.50c.
Flats and squares ..... 3.50c.
Hot-rolled strip ..... 3.30c.
Hot-rolled annealed sheets (No. 24) 3.85c.
Galv. sheets (No. 24) ..... 4.55c.
Hot-rolled sheets (No. 10) ..... 3.95c.
Spikes (keg lots) ..... 3.50c.
Track bolts (keg lots) ..... 4.65c.
Rivets, structural (keg lots) ..... 3.65c.
Rivets, boiler (keg lots) ..... 3.75c.

Per Cent Off List

Machine bolts *70
Carriage bolts *70
Lag screws *70
Hot-pressed nuts, sq. tap. or
Hot-pressed nuts, sq. tap or blank.. *70
Hot-pressed nuts, hex. tap or
Hot-pressed nuts, hex. tap or blank.. *70
Hex. head cap screws 80
Cut point set screws .....70 and 10
Flat head bright wood screws.37½ and 10
Spring cotters 50
Stove bolts in full packages..... 70
Rd. hd. tank rivets, 7/16 in. and smaller 57½
Wrought washers .....$4.50 off list
No. 8 black ann'l'd wire per 100 lb...$3.85
Com. wire nails, base per keg..... 3.05
Cement c't'd nails, base per keg.... 3.05

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. All prices are f.o.b. consumers' plants within the Chicago switching district.

*These are quotations delivered to city trade for quantities of 100 lb. or more. For lots of less than 100 lb., the quotation is 65 per cent off. Discounts applying to country trade are 70 per cent off, f.o.b., Chicago, with full or partial freight allowed up to 50c. per 100 lb.

NEW YORK

Base per Lb.

Plates, ¼ in. and heavier..... 3.40c.
Structural shapes ..... 3.37c.
Soft steel bars, small shapes..... 3.22c.
Iron bars ..... 3.22c.
Iron bars, swed. charcoal....6.75c. to 7.25c.
Cold-fin. shafting and screw stock:
Rounds and hexagons ..... 3.77c.
Flats and squares ..... 4.27c.
Cold-rolled; strip, soft and quarter hard ..... 3.32c.
Hoops ..... 3.52c.
Bands ..... 3.52c.
Hot-rolled sheet (No. 10)..... 3.27c.
Hot-rolled ann'l'd sheets (No. 24*) 3.85c.
Galvanized sheets (No. 24*) ..... 4.50c.
Long terne sheets (No. 24) ..... 5.20c.
Standard tool steel .....11.00c.
Wire, black annealed (No. 10)..... 3.40c.
Wire, galv. (No. 10) ..... 3.75c.
Tire steel, 1 x ½ in. and larger.. 3.65c.
Open hearth spring steel..4.00c. to 10.00c.
Common wire nails, base, per keg... $3.21

Per Cent

Machine bolts, cut thread: Off List
All diameters .....65 and 70
Carriage bolts, cut thread:
All diameters .....65 and 70

Per 100 Ft.

Boiler tubes:
Lap welded, 2-in. $18.05
Seamless welded, 2-in. 19.24
Charcoal iron, 2-in. 24.94
Charcoal iron, 4-in. 63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes..... 3.44c.
Bars, soft steel or iron..... 3.19c.
Cold-fin. rounds, shafting, screw stocks ..... 3.74c.
Hot-rolled annealed sheets (No. 24) 4.09c.
Galv. sheets (No. 24) ..... 4.64c.
Hot-rolled sheets (No. 10) ..... 3.29c.
Black corrug. sheets (No. 24)..... 4.09c.
*Galv. corrug. sheets ..... 4.64c.
Structural rivets ..... 3.99c.
Boiler rivets ..... 4.09c.

Per Cent Off List

Tank rivets, 7/16 in. and smaller.... 55
Machine and carriage bolts, lag screws fittings up bolts, bolt ends, plow bolts, hot-pressed nuts, square and hexagon, tapped or blank, semi-finished nuts: All quantities 70

*No. 26 and lighter take special prices.

PHILADELPHIA

Base per Lb.

*Plates, ¼-in. and heavier..... 2.95c.
*Structural shapes ..... 2.95c.
*Soft steel bars, small shapes, iron bars (except bands) ..... 2.90c.
‡Reinforc. steel bars, sq. twisted and deformed ..... 2.955c.
Cold-finished steel bars ..... 3.73c.
*Steel hoops ..... 3.40c.
*Steel bands, No. 12 and 3/16 in., incl. ..... 3.15c.
Spring steel ..... 5.00c.
†Hot-rolled anneal. sheets (No. 24) 3.55c.
†Galvanized sheets (No. 24)..... 4.25c.
*Hot-rolled annealed sheets (No. 10) ..... 3.05c.
Diam. pat. floor plates, ¼ in.... 4.95c.
Swedish iron bars ..... 6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices subject to deduction on orders aggregating 4000 lb. or over.

†For 50 bundles or over.

‡For less than 2000 lb.

CLEVELAND

Base per Lb.

Plates and struc. shapes ..... 3.31c.
Soft steel bars ..... 2.95c.
Reinforc. steel bars .....*2.10c.
Cold-finished steel bars ..... 3.25c.
Flat-rolled steel under ¼ in. ..... 3.36c.
Cold-finished strip .....†3.00c.
Hot-rolled annealed sheets (No. 24) 3.96c.
Galvanized sheets (No. 24) ..... 4.61c.
Hot-rolled sheets (No. 10) ..... 3.11c.
Hot-rolled 3/16 in. 24 to 48 in. wide sheets ..... 3.56c.
Black ann'l'd wire, per 100 lb. $2.65
No. 9 galv. wire, per 100 lb. 3.00
Com. wire nails, base per keg..... 2.40

*Plus mill, size and quantity extras.
†Outside delivery 10c. less.

CINCINNATI

Base per Lb.

Plates and struc. shapes ..... 3.40c.
Bars, soft steel or iron..... 3.15c.
New billet reinforc. bars..... 3.25c.
Rail steel reinforc. bars..... 3.25c.
Hoops and bands, 3/16 in. and lighter ..... 3.45c.
Cold-finished bars ..... 3.75c.
Hot-rolled annealed sheets (No. 24) 4.00c.
Galv. sheets (No. 24) ..... 4.70c.
Hot-rolled sheets (No. 10)..... 3.20c.
Structural rivets ..... 4.35c.
Small rivets .....55 per cent off list
No. 9 ann'l'd wire, per 100 lb. (1000 lb. or over) $2.91
Com. wire nails, base per keg:
1 to 24 kegs 3.50
25 to 50 kegs 3.30
Large quantities 3.10
Cement c't'd nails, base 100-lb. keg 3.50
Chain, 1-in., per 100 lb. 8.35

Net per 100 Ft.

Seamless steel boiler tubes, 2-in. $19.03
4-in. 44.96
Lap-welded steel boiler tubes, 2-in. 18.10
4-in. 42.32

BUFFALO

Base per Lb.

Plates ..... 3.37c.
Struc. shapes ..... 3.25c.
Soft. steel bars ..... 3.06c.
Reinforcing bars ..... 2.60c.
Cold-fin. flats and sq. ..... 3.55c.
Round and hex. ..... 3.55c.
Cold-rolled strip steel ..... 3.19c.
Hot-rolled annealed sheets (No. 24) 4.05c.
Heavy hot-rolled sheets, 3/16 in., 24 to 48 in. wide ..... 3.62c.
Galv. sheets (No. 24) ..... 4.70c.
Bands ..... 3.42c.
Hoops ..... 3.42c.
Hot-rolled unannealed sheets ..... 3.17c.
Com. wire nails, base per keg..... $3.35
Black wire, base per 100 lb. 3.55

BOSTON

Per Lb. Base

Beams, channels, angles, tees, zees 3.52c.
H beams and shapes ..... 3.52c.
Plates—sheared, tank and univ. mill, ¼ in. thick and heavier ..... 3.53c.
Floor plates, diamond pattern .... 5.33c.
Bar and bar shapes (mild steel).. 3.30c.
Bands 3/16 in. thick and No. 12 ga. incl.....3.60c. to 4.60c.
Half rounds, half ovals, ovals and bevels ..... 4.55c.
Tire steel ..... 4.55c.
Cold-rolled strip steel .....3.245c.
Cold-finished rounds, squares and hexagons ..... 3.85c.
Cold-finished flats ..... 3.70c.
Blue annealed sheets, No. 10 gal... 3.60c.
One pass cold-rolled sheets No. 24 ga. ..... 4.15c.
Galvanized steel sheets, No. 24 ga. 4.85c.
Lead coated sheets, No. 24 ga. .... 5.80c.

Prices delivered by truck in metropolitan Boston, subject to quantity differentials.

MILWAUKEE

Base per Lb.

Plates and structural shapes ..... 3.31c.
Soft steel bars ..... 3.06c.
Hot-rolled strip ..... 3.41c.
Hot-rolled sheets (No. 10)..... 3.16c.
Hot-rolled annealed sheets (No. 24) 3.96c.
Galvanized sheets (No. 24)..... 4.66c.
Cold-finished steel bars ..... 3.61c.
Cold-rolled strip ..... 3.30c.
Structural rivets (keg lots) ..... 3.86c.
Boiler rivets (keg lots) ..... 3.96c.
Track spikes (keg lots) ..... 3.71c.
Track bolts (keg lots) ..... 4.86c.
Black annealed wire ..... 3.10c.
Com. wire nails ..... 3.90c.
Cement coated nails ..... 2.90c.

Per Cent Off List

Machine bolts 70
Carriage bolts 70
Hot-pressed nuts, sq. and hex., tapped or blank (keg lots) 70

Prices given above are delivered Milwaukee.

On plates, shapes, bars, hot-rolled strip and heavy hot-rolled sheets, the base applies on orders of 400 to 9999 lb. On galvanized and No. 24 hot-rolled annealed sheets the prices given apply on order of 400 to 3499 lb. On cold-finished bars the prices are for orders of 300 to 499 lb

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates, tank and U. M.	3.55c.	3.60c.	3.55c.
Shapes, standard	3.55c.	3.60c.	3.55c.
Soft steel bars	3.60c.	3.60c.	3.60c.
Reinforcing bars, f.o.b. cars dock			
Pacific ports	2.45c.	2.45c.	2.45c.
Hot-rolled annealed sheets (No. 24)	4.40c.	4.35c.	4.40c.
Hot-rolled sheets (No. 10)	3.75c.	3.70c.	3.75c.
Galv. sheets (No. 24)	5.00c.	4.95c.	5.00c.
Cold finished steel:			
Rounds	5.95c.	5.85c.	6.00c.
Squares and hexagons	7.20c.	7.10c.	7.25c.
Flats	7.70c.	7.60c.	8.25c.
Common wire nails —base per keg	$3.30	$3.40	$3.30

All items subject to differentials for quantity.

TOOL STEEL

Prices are same for warehouse distribution at all points on or East of Mississippi River. West of Mississippi quotations are 1c. a lb. higher.

Base per Lb.

High speed ..... 57c.
High carbon chrome ..... 37c.
Oil hardening ..... 23c.
Extra ..... 17c.
Regular ..... 14c.

Weekly Indications of Steel Activity

From The Iron Age

	Apr. 16, 1935	Apr. 9, 1935	Mar. 19, 1935	Apr. 17, 1934	Average, Year to Date, 1935	1934
Steel ingot operations—Per cent of capacity	46.5	46.0	47.0	52.0	49.0	42.3

	Week Ended Apr. 16, 1935	Apr. 9, 1935	Mar. 19, 1935	Apr. 17, 1934	Year to Date 1935	1934
Fabricated structural steel awards	32,025	10,600	45,800	13,650	222,138	234,825
Fabricated plate awards	4,410	2,850	1,425	3,650	31,365	34,332
Sheet steel piling awards	150	0	0	2,375	3,915	17,570
Reinforcing bar awards	16,955	1,800	7,800	5,200	75,690	69,280

Modernize
with power saving
Chain Drives
Chain Drives offer definite savings in power costs on plant or equipment applications. They give increased machine capacity through the maintenance of constant speeds and the positive transmission of power. They give capacity for unusual overload demands with long life and freedom from excessive maintenance costs.
WHITNEY offers the experience of over a quarter of a century of building dependable power drives.
The Whitney Mfg. Co., Hartford, Conn.
WHITNEY
CHAIN DRIVES

How Attractive Finish Helps Metal Products Sales

(CONTINUED FROM PAGE 17)

ity to withstand abrasion and other abuses in handling, and resistance to sulphurous fumes.

This service from a lead chromate base primer depends also upon a careful balance in the formulation of the vehicle in the paint. Linseed and other oils in use will often absorb moisture upon application, and after drying leave a porous film. Too fast drying by the incorporation of driers will affect the life of the film. It is possible to obtain a tight and resistant film by a careful blending of linseed oil with fossil resins and tung oil.

Corrosion in its simpler forms is now generally considered to be the result of an electrolytic action set up on the surface of the metal. Varying concentrations result from different potentials set up due to chemical and physical differences on the surface. The presence of air in water or moisture in air are definite influences in the return of the metal to its oxidized state.

The application of metallic or other electrically conductive paints seems also to speed the breaking down of the metal. This is especially noticeable on high tension towers and switching stations. Consequently, most of the graphite and graphite-carbon base paints, as well as the metallic paints, can be safely recommended only as finishing coats. In this capacity they serve excellently, often under severe conditions. The graphite-carbon paint is perhaps the nearest to an all-purpose finishing paint for metal protection.

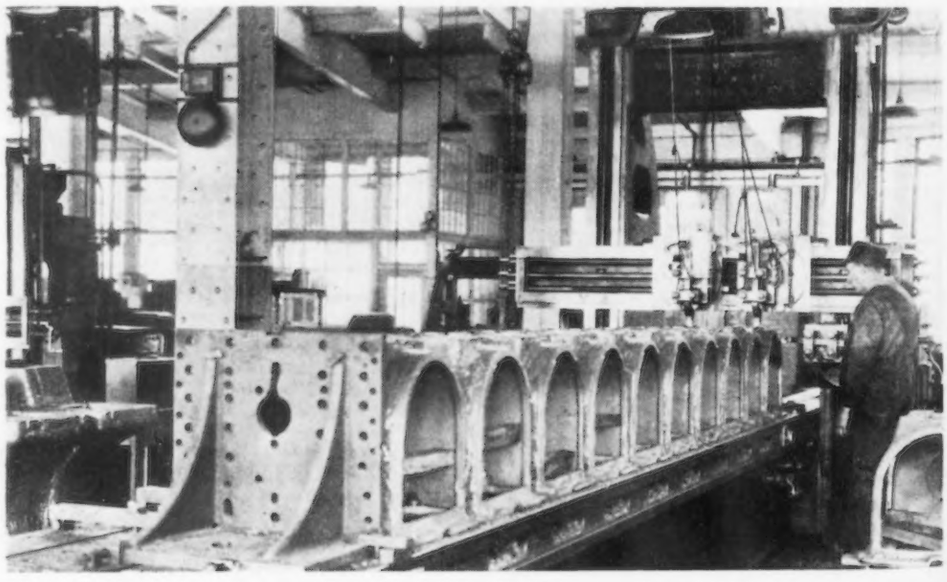
Metal surfaces subjected to attacks by alkali or acid fumes should be given finishing coats specially formulated to withstand these conditions. Paints containing phenolic or other highly resistant synthetic resins are usually

o o o

BY the use of bright reflecting surfaces this operator was given better working light on his planer, from the outside daylight source than he previously had from a hanging electric bulb.

Courtesy Pratt & Whitney Co.

o o o



satisfactory. Asphaltic compounds combined with mineral spirits give good service, and two or more coats should be applied. Where color is desirable for its harmonizing or decorative effects, or white for its high heat radiation and reflection properties, there are a number of oil or synthetic paints and enamels available. These are formulated to withstand heat, fumes, chemicals and other severe conditions common to industries.

Plant interiors subject to various fume conditions, excess moisture, high temperatures, and other adverse conditions all require special treatment. The selection of paints designated as resistant or proof against such conditions will go a long way toward cutting the maintenance dollar. Inasmuch as labor is always the biggest item, quality paints formulated for long life usually prove more economical. Cheaper paints may discolor, chalk, peel, have less coverage and hiding power to the gallon, and fail utterly in moisture, heat and fume resistance, or lack durability, washability and resistance to abrasion.

The maintenance man in the market for a paint for storage tanks, gas holders or other surfaces subject to sulphur fumes or the sulphureted hydrogen gas from a gas holder should never pick a white lead base paint. The initial heat reflection and light reflection values are too soon lost due to the formation of lead sulphide, a black substance. A paint having a basic zinc oxide pigment will give good service and avoid objectionable blackening.

Galvanized metal and concrete surfaces should be allowed to weather before painting, if possible. A solution of 8 oz. of either copper acetate or copper sulphate to the gallon of water should be applied to the surface before painting galvanized metal. This should be followed with a special primer, usually a zinc dust or zinc oxide paint coating. This will avoid the wholesale peeling of paint so commonly seen.

Concrete should be washed with a solution of 2 lb. of zinc sulphate to the gallon of water. This will avoid the dangers from free alkali. Porous surfaces should be given a sealer coat, and finishing coats should be special concrete paints.

Surfaces to receive any paint coating should be clean, dry, free from grease, and properly treated before painting.

Leading paint manufacturers active in the industrial field have not only formulated special paints for the numerous requirements, but have established industrial service departments devoted to preparing complete plant specification charts covering every need for a given industry.

The maintenance man desirous of cutting maintenance costs by efficient paint should avail himself of this free service.

Thomas Prosser & Son, New York, importers and distributers of Widia Cemented Carbides, have opened a Detroit office at 7310 Woodward Avenue. E. R. S. Reeder, district manager, is in charge of the new office.

Make this TEST

We'll Send the Metal Strips and the "Bender" Booklet at Your Request

Abuse-tests indicate *permanent* resistance to Chipping, Flaking, Peeling. For 10 years, *Flexible Blue Knight* BLAX (and colors) have rendered great service to many of the metal working industries.

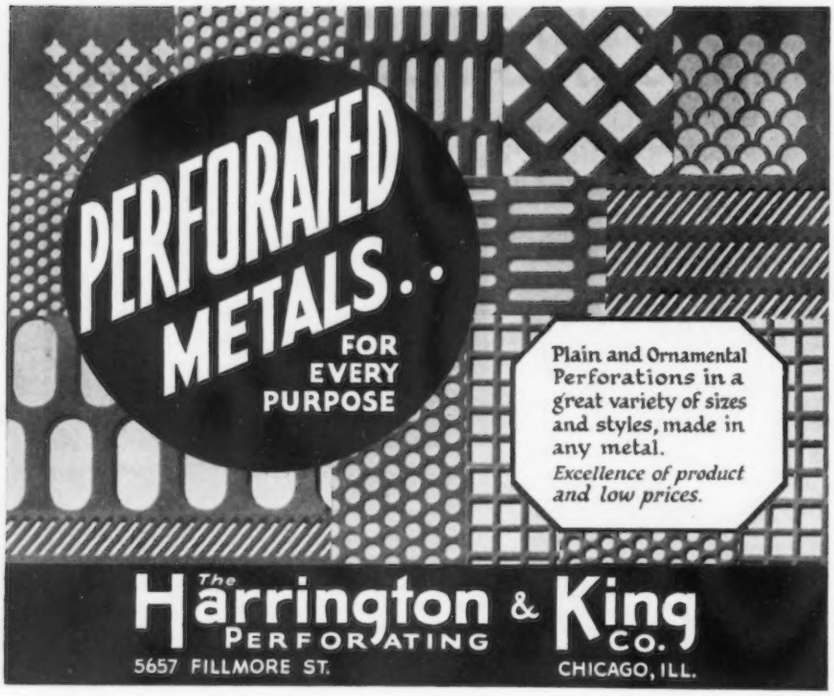
This outstanding one-coat, air-dry, no-bake finish gives a beautiful, lasting job . . . without primer. Stands blanking and forming. Accelerated aging test — *two years in the oven at 212° F.*—produces no sign of brittleness. Finish retains remarkable flexibility and adhesion.

Write for metal strips and "Bender" booklet, so you can make an "abuse-test" on your own. Find out more about this finish that stands up under strenuous assembly operations and actual service conditions. Address letterhead request to Dept. 802.

ROXALIN FLEXIBLE LACQUER COMPANY, INC., ELIZABETH, N. J.

ROXALIN *Flexible* FINISHES

CELLULOSE & SYNTHETIC TYPES ENGINEERED FOR SPECIFIC PERFORMANCE


PERFORATED METALS..
FOR EVERY PURPOSE
Plain and Ornamental Perforations in a great variety of sizes and styles, made in any metal.
Excellence of product and low prices.
The Harrington & King PERFORATING CO.
5657 FILLMORE ST.
CHICAGO, ILL.

Reinforcing Steel

Awards 16,955 Tons—New Projects 4670 Tons

AWARDS

Taunton, Mass., 176 tons, State hospital, to Northern Steel Co.

Worcester, Mass., 100 tons, hospital ward and surgical building to Concrete Steel Co.

Roby, Ind., 180 tons, American Maize Products Co., to Calumet Steel Co.

Evanston, Ill., 100 tons, Service Building, to Calumet Steel Co.

Chicago, 300 tons, Walgreen Drug Co. warehouse, to Calumet Steel Co.

Chicago, 150 tons, building for Electro Motive Corpn., to Truscon Steel Co.

Milwaukee, 3600 tons, filtration plant, to an unnamed bidder.

State of Illinois, 200 tons, road work, to Calumet Steel Co.

Fort Peck, Mont., 11,000 tons, spillway gates, to R. C. Mahon.

San Francisco, 700 tons, Marina junior high school, to Truscon Steel Co.

Madera, Cal., 100 tons, County hospital, to an unnamed bidder.

Seattle, 100 tons, addition for Century Brewing Co., to Pacific Coast Steel Corpn.

San Diego, Cal., 100 tons, factory for Consolidated Aircraft Corpn., to an unnamed bidder.

Los Angeles, 150 tons, chapel for Calvary Cemetery, to an unnamed bidder.

NEW REINFORCING BAR PROJECTS

Chicago, 200 tons, International Printing Ink Co.

St. Paul, Minn., 500 tons, sewer project.

Beach City, Ohio, 588 tons, dam for Muskingum Conservancy District; bids to be taken by U. S. Engineer, Zanesville, Ohio, April 20.

State of Texas, 525 tons, highway bridges.

Alton, Ill., 1300 tons, dam No. 26 in Mississippi River; Engineering Construction Co., New York, low bidder.

Phoenix, Ariz., 167 tons, State underpass; bids April 23.

Eureka, Cal., 200 tons additional, Mad River dam and pipe line; bids April 23.

San Francisco, 1250 tons additional, Trans-Bay distribution structure; bids opened April 17.

South San Francisco, 100 tons, State underpass; bids under advisement.

San Francisco, 350 tons, Francis Scott Key school; bids April 24.

Los Angeles County, Cal., 247 tons, State overpass at Arroyo de las Posas; bids May 2.

San Diego, 100 tons, Government exposition building; bids under advisement.

San Diego, 200 tons, exposition music bowl; bids open.

San Bernardino, Cal., 100 tons, warehouse addition; general contract awarded.

State of California, 135 tons, highway work in Orange and San Bernardino counties; bids April 25.

Alton Dam Bids Taken at St. Louis

ST. LOUIS, April 16.—Virtually all pig iron under contract for shipment in the second quarter and requiring a long-distance haul has been ordered shipped, specifications having been stepped up in anticipation of the emergency freight-rate advance effective Thursday. Not a great deal of new business was brought out, however. It is expected that the emergency increase will have the effect of advancing prices on pig iron for the third quarter. The melt in the district is being well maintained, and it is expected that increased Government expenditures will provide further stimulation to the buying of products of foundries.

The emergency freight-rate advance has made little, if any, difference in the movement of the finished iron and steel from either mills or warehouses.

Engineering Construction Co., New York, is low bidder on the general contract for the construction of Dam No. 26 in the Mississippi River opposite Alton, Ill., with a tender of $4,865,717, as compared with the Government estimate of $4,210,792. The project will require 5930 tons of structural steel, 1320 tons of reinforcing steel, 211,000 sq. ft. of steel sheet piling, and other ferrous and non-ferrous metal products.

Bids have been asked for May 14, instead of May 11, as at first announced, for the superstructure of the St. Louis post office, requiring between 7000 and 8000 tons of structural steel.

The scrap market continues weak. Because of low prices, the movement of scrap into the district is being retarded. Prices are unchanged.

Production Unchanged In South

BIRMINGHAM, April 16.—Production in the Birmingham district remains steady, with a tendency toward a slight advance in some lines. Cast iron pressure pipe manufacturers have increased production slightly, although the demand is spotty and rather uncertain.

Steel production has not changed since Feb. 12, and present plans call for operations on the present basis for another month or six weeks. The Tennessee Coal, Iron & Railroad Co. has nine open-hearth furnaces in operation at its Fairfield and Ensley works. Five blast furnaces are supplying the iron for the company's operations. The Ensley plant is running entirely upon back orders for rails. Operations are not at capacity here and the plants will probably take until the latter part of May or June 1 to complete the 71,000 tons the company booked early in the first quarter.

In addition to the Tennessee company, the Gulf States Steel Co. will continue for an indefinite period on its present operations. The company has three open-hearth

furnaces supplying its steel requirements, principally for sheets and wire products. Throughout the territory, the day-to-day requirements for sheets and wire products have held up beyond expectations of the producers.

There has been a slight increase during the past week in the demand for pig iron. The increase is attributed by producers to a tendency to increase stocks in anticipation of the increased freight rates rather than to increased operations of the melters.

Four blast furnaces in the district are producing merchant pig iron. The Sloss-Sheffield Steel & Iron Co. has one furnace in operation and another scheduled to go into blast when extensive repairs are completed. The Woodward Iron Co. has one, and the Republic Steel Corpn. two furnaces in operation.

Southern Ohio Mills Hold High Rate

CINCINNATI, April 16.—Ordering of pig iron is held to immediate needs despite the impending freight rate advance. Shipments against contracts adhere to the March rate as district melters hold inventories to conservative levels. The emergency freight rate advance in this area will be about 7c. on Northern iron, but Southern furnaces will be forced to absorb an advance of 18c. to maintain the present 38c. differential. Foundry operations are steady, but unspectacular. The stove and specialty melters are running substantial heats, but other foundries are on sporadic schedules.

A week-end rush to cover boosted the sheet mill bookings in this area to about 75 per cent of capacity. Automobile demand, except from one maker of low-priced cars, tends to level off, but refrigerator and stove demand reflects increasing activity in those fields. The leading interest reports average operations over all units at about 70 to 75 per cent of full capacity.

Domestic coke is moving in heavy volume under the stimulus of a price cut of $1.75 in wholesale price. This grade is now quotable at $4.50, delivered in Cincinnati. Foundry grades are without change.

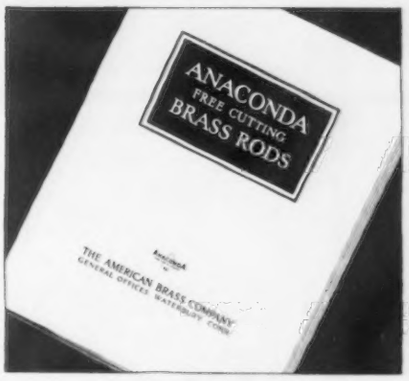
The district scrap market is featureless. Quotations are unchanged and nominal, but the market undertone is soft. Some scrap is moving on contract, but new business is nil.

Freight Advances Not Applied in 36 States

THE emergency freight charges which go into effect on April 18 on certain steel products and raw materials apply to interstate traffic but will apply to intrastate traffic in only a few States in the immediate future. Until authorized by lettered supplements to the emergency charges now submitted by railroads, the increases will not apply to intrastate traffic between points in the following States: Alabama, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming.

Can you save money by spending *more* for stock?

This free booklet tells how Brass Rod cuts costs of screw machine products . . .



THIS complete new booklet has been called a "liberal education" by experienced production men. Going thoroughly into details, it treats of tool life, tool breakage, power consumption and the many other factors that help determine the ultimate cost of screw machine parts.

Special cold drawn and extruded shapes . . . that save their metal cost many times over by eliminating expensive milling and other machining operations . . . are reviewed in detail.

In addition to Brass, the characteristics of Anaconda Free Cutting Phosphor Bronze, leaded Nickel Silver, Everdur, and other Anaconda Free Cutting Alloys are also described.

If you make, sell, buy or use screw machine parts of *any metal,* you'll want this booklet. For your copy, mail the coupon today.

THE AMERICAN BRASS CO.
General Offices: Waterbury, Connecticut
Offices and Agencies in Principal Cities

MAIL THIS COUPON NOW!

1A4

THE AMERICAN BRASS CO., Waterbury, Conn.
Please send me a *free* copy of your new Brass Rod Booklet, Anaconda Publication B-14, by return mail.

*Name*_____ *Title*_____
*Company*_____
*City*_____ *State*_____

ANACONDA COPPER & BRASS

GOOD SERVICE MADE BETTER

Milne Service means: (1) the best of tool steels; (2) good service; (3) speedy deliveries. Our large and diversified stocks in various centers are immediately put at your disposal through the use of Bell System Teletypewriter and Toll Services. Telephone, teletype or telegraph your orders and inquiries collect to our nearest office.

A. MILNE & CO.

Established 1887

HOME OFFICE
New York, N. Y., 745 Washington St., Tel. CHelsea 3-5315, Teletypewriter NY-1-146

BRANCH OFFICES AND WAREHOUSES
Boston, Mass., 915 Oliver Building, Tel. Hancock 4999, Teletypewriter BOS-270
Chicago, Ill., 17 N. May Street, Tel. Monroe 2996, Teletypewriter CGO-20
New Orleans, La., 611 So. Peters St., Tel. Main 0011, Teletypewriter NO-83

Representatives elsewhere who can get in touch with you quickly.

Kaiser Wilhelm Institute Issues Pamphlets Covering 1934 Research

TWENTY-ONE bulletins on iron and steel research carried on by the Kaiser Wilhelm Institute in Düsseldorf during 1934 is now complete. As usual, the reports cover a wide variety of subjects ranging from almost pure chemistry, through metallurgy, strength of iron and steel, plastic flow, to purely mechanical properties of iron and steel. According to W. Trinks, of the Carnegie Institute of Technology, the titles of the papers are as follows: (1) reaction heat of Fe_3C_2; (2), (a) coarse grained recrystallization of high carbon steel, (b) local formation of martinsite in steel wire; (3) the measuring of elastic stresses by X-rays; (4) influence of friction and of shape of cross-section upon flow of material in the rolling mill; (5) the hot drawing of seamless tubes; (6) influence of various slags upon crystallization and mechanical properties of grey cast iron; (7) the basis of desulphurization of pig iron and steel; (8), (a) metallurgy of crucible steel made in the induction furnace, (b) production of tool steel in the induction furnace; (9) compression resistance of steel in grooved rolls; (10), (a) effect of carbon content and heat treatment on the drawing properties of steel wire, (b) influence of carbon content and patenting conditions on strength of drawn steel wire; (11), (a) hydrogen brittleness of steel as a function of absorbed quantity of hydrogen, (b) penetration of brass into steel during brazing as a consequence of hydrogen absorption in pickling; (12) creep strength of steel above 500 deg. C., (13) influence of preparation of specimens on the results of magnetic tests; (14) influence of grain structure upon creep strength of steel; (15) magnetic properties of natural and artificial iron oxides; (16) influence of shape of specimen, type of grips, deformation velocity and type of testing machine upon the position of upper and lower yield point of steel; (17) metallurgy of acid open hearth process; (18) combined carbon in hardened and in tempered steels; (19), (a) specific heat of Fe_3C, (b) thermal decomposition of Fe_3C; (20), (a) deformation in the drawing of wire, (b) stresses and flow of material in the drawing of tubes; (21) the yield point as a function of stress distribution and material.

The bulletins can be purchased from Verlag Stahleisen, Düsseldorf, Germany, either singly or collectively. In the latter case their price is 24 marks, loose, or 27 marks, bound (a mark is now about 41 cents). The 1934 volume contains 239 pages with 425 illustrations, 5 plates and 80 tables.

Republic Answers Government's Suit

THE Republic Steel Corpn., the Corrigan, McKinney Steel Co., and others named in the Government's suit attacking the Republic - Corrigan, McKinney merger filed a joint reply brief in Federal District Court in Cleveland on April 16, upholding the merger by citing a long series of precedents from decisions of the United States Supreme Court.

The brief characterized as "entirely fantastic" the Government's contention that the Clayton Act forbids a corporation from buying the assets and business of another corporation where the consideration of purchase is stock of the buying corporation.

The brief emphasized the small degree of competition between Republic and Corrigan, McKinney, and pointed out that the Supreme Court has held that in order to constitute a violation of the Clayton Act the lessening of competition between two corporations concerned must be to such a degree as "will injuriously affect the public." The brief contended that the proposed merger could have no such effect.

Special tungsten-carbide tipped tools, including reamers, inserted-blade cutters, and a 42-in. diameter milling cutter form an interesting pictorial section of a new loose-leaf catalog issued by the Wesson Co., 1050 Mt. Elliott, Detroit. Standard and special high-speed steel and carbide-tipped counterbores, spotfacers, and multi-dimension cutters are also shown, as well as floating holders, tool bit holders, three-way vises and tool lapping machines.

George Rahmann & Co., New York, maker of belting and leather specialties, celebrated its 40th anniversary on April 12 with a reception for out-of-town managers and salesmen. A. H. Rahmann, president, was presented with a leather desk chair.

Wheeling Structural Steel Co., Wheeling, W. Va., has arranged for change of name to Riverside Steel Co., specializing in production of steel and iron structural and ornamental shapes. Line of output will be increased to include steel building materials as produced by Macomber Steel Co., Canton, Ohio, such as bar joints, roof decking, etc. Wright Hugus is president.

Pipe Lines

Texas Pipe Line Co., Texas Co. Building, Houston, Tex., plans welded steel pipe line to Port Lavaca, Tex., about 30 miles, for crude oil. Cost over $75,000.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 26 for corrosion-resisting steel pipe and tubing for Eastern and Western navy yards (Schedule 4724).

Eureka, Cal., closes bids April 23 for 40,375 lin. ft. of 24-in., 19,550 lin. ft. 21-in., 1245 lin. ft. 18-in., and 1170 lin. ft. 12-in. steel pipe for Mad River water supply system near Korbel, Cal., to city limits, with alternate estimates, each size pipe noted, for (a) centrifugal concrete-lined and gunite-coated steel pipe, (b) cement-wrapped steel duroline pipe, and (c) cement-wrapped bituminous steel pipe; also for steel pipe accessories. Bids asked at same time for water terminal reservoir, headworks and other construction. Fund of $1,224,000 has been arranged. Clyde C. Kennedy, Call Building, San Francisco, is consulting engineer.

Michigan Exploration Co., Muskegon, Mich., is considering new welded steel pipe line for natural gas from gas wells in Mecosta-Montcalm, Mich., district to Flint, Mich., for service to large industrial consumers in latter area.

White Star Refining Co., 903 West Grand Boulevard, Detroit, a division of Socony-Vacuum Oil Co., Inc., New York, has let contract to Coolsaet Brothers, Dearborn, Mich., for two 6-in. welded steel pipe lines from Lakeside terminal slip of Grand Trunk Railway to new bulk oil plant near Muskegon, Mich., about 1½ miles, for oil and gasoline service.

National Park Service, Underwood Building, San Francisco, plans about 3650 ft. of 18 to 22-in. steel pipe for water flow line in connection with expansion and improvements in hydroelectric power plant, Yellowstone Park, Wyo.; also about 9800 ft. of 28-in. penstock pipe and about two miles of 10-in. welded steel pipe for water system. Fund of $230,000 is available for complete project, including generating plant equipment. F. A. Kittredge, address noted, is engineer; J. W. Emmert, Yellowstone Park, is acting superintendent.

Panguitch, Utah, will take bids April 24 on 435 tons of 6 and 8-in. steel pipe.

Cast Iron Pipe

Wareham, Mass., has awarded 1100 tons of various sizes to R. D. Wood Co.

Sterling, Mass., is in the market for four miles of 6, 8 and 10-in.; bids close April 30.

Leominster, Mass., has awarded 4500 ft. of 16-in. and 2500 ft. of class 150 to R. D. Wood Co.

Russell, Kan., will soon take bids for pipe for water system; also for elevated steel tank and tower, reservoir and other waterworks construction. Bond issue of $120,000 has been authorized. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

Metropolitan Water District, Hartford, Conn., plans extensions in trunk water pipe lines in several streets, totaling about 7100 ft. C. M. Saville is engineer.

Ganado, Tex., plans water pipe lines. Fund of $60,000 is being arranged for this and other waterworks construction, and sewage system. M. C. St. John, Esperson Building, Houston, Tex., is consulting engineer.

Seal Beach, Cal., has authorized bond issue of $30,000 for water pipe lines and other waterworks equipment. Victor Hayes, 302 East Anaheim Street, Long Beach, Cal., is consulting engineer.

Clifford, Mich., plans pipe lines for water distribution; also elevated tank and tower. Fund of $19,000 is being arranged. Francis Engineering Co., Eddy Building, Saginaw, Mich., is consulting engineer.

Topeka, Kan., plans extensions in water pipe lines in Highland Park district. Financing is being arranged. Water Bureau is in charge.

Fuquay Springs, N. C., plans pipe lines for water system. Bond issue of $65,000 has been authorized for this and other waterworks equipment and sewage system. W. S. Cozart, mayor, in charge.

Southside Place, Tex., plans water pipe lines; also elevated steel tank and tower, pumping machinery and accessory waterworks equipment. Fund of $48,000 is being arranged. M. C. St. John, Esperson Building, Houston, Tex., is consulting engineer.

Tishomingo, Okla., plans new trunk pipe line from new water supply source at Pennington Creek, near Ballard Park. Cost about $45,000 with waterworks station.

Julesburg, Colo., plans water pipe lines; also pumping machinery and auxiliary equipment. Bond issue of $50,000 is being sold.

Board of Shaler Township Commissioners, Pittsburgh, care of F. G. Ross, 309 Fourth Avenue, engineer, asks bids until April 23 for 96,000 ft. of 4 to 8-in. for water supply in township; also about 28 tons of miscellaneous castings. Fund of $223,000 has been arranged for this and sewer system, for which bids will be received at same time.

Bloomington, Idaho, opened bids April 15 on 158 tons of 2 to 6-in.

West Slope Water District, Portland, Ore., opened bids April 18 on 200 tons of 3 to 6-in., with alternates on steel pipe.

Spokane, Wash., will take bids April 25 on 118 tons.

Panguitch, Utah, will take bids April 24 on 262 tons of 2 to 8-in.

Ridgefield, Wash., has taken bids on 189 tons of cast iron pipe, with alternates on 135 tons of steel pipe.

STEEL FOR INDUSTRY

There is a BISCO Specialty for Each Tool Steel Application

BISCO

TOOL STEEL TUBING
NON-SHRINK OIL HARDENING

Saves Weight and Machining Costs for

RING DIES—SPACERS—BUSHINGS

Shipment From Stock Up to 12" O.D. 2" Wall
Larger Sizes Available

Complete Stocks of BALL BEARING TUBING
In 52100 and 4615 Analyses

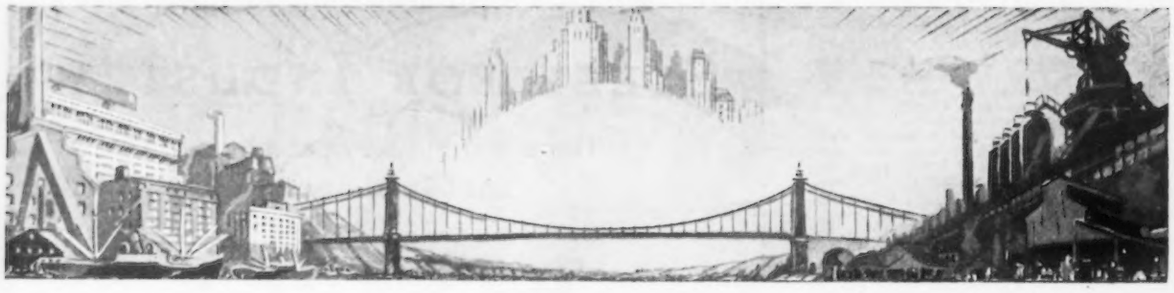
Write for Literature

THE BISSETT STEEL COMPANY
CLEVELAND
CHICAGO CINCINNATI

TUNGSTEN CARBIDE

DRAWING DIES FOR WIRE, ROD, TUBING
BOLT EXTRUSION DIES
TIPPED CUTTING TOOLS

TUNGSTEN ELECTRIC CORPORATION
BISSETT STEEL DIVISION



Plant Expansion and Equipment Buying

Machine Tool Trade Awaits Detroit Developments — Inquiry Still Good

INTEREST in the machine tool trade is still centered on the automotive industry, particularly since announcement of the fall automobile show in New York on Nov. 2 has been made. It is now believed certain that automobile companies, if they are to have new models on the market in time for the show, will have to begin their tool purchases before the end of the present quarter.

Tool demand from other sources is holding its own and the industry's index last month snapped back to 62.3 from 53.0 in February. It is now deemed likely that the high rate of 66.1 reached in December may be passed in the current quarter. Buying of tools and equipment by the steel industry is still a feature of the current market.

NORTH ATLANTIC

Ehrenberg Brass Mfg. Co., 135 Mulberry Street, New York, manufacturer of plumbers' brass goods and kindred brass specialties, has leased one-story building, 175 x 200 ft., to be erected on Thirty-fifth Street, near Queens Boulevard, Long Island City, for new plant. Cost over $70,000 with equipment.

Union Bag & Paper Corpn., Woolworth Building, New York, is selecting a large tract at Savannah, Ga., as site for new pulp and paper mill, with paper-converting plant for bag and container production on adjoining land. Project will include power house, machine shop and other mechanical units. Timber rights to tracts of Georgia slash pine are being secured for raw material supply. Entire project will cost close to $4,000,000 with machinery. Company also has plans maturing for similar mill in Eastport district, Jacksonville, Fla., where 1200 acres is being leased from city and county governments. It will cost over $3,000,000 with equipment.

Signal Supply Officer, Army Base, Brooklyn, asks bids until April 29 for quantity of telephone cable (Circular 111); until May 13, for 350 generators (Circular 113).

McNeal Fence Construction Co., Inc., Schenectady, N. Y., has been organized by Leon W. McNeal, Church Street, Saratoga Springs, N. Y., and Harold McNeal, 1341 Glenwood Boulevard, Schenectady, to manufacture iron and wire fencing.

Bernard Karp Co., 350 Greenwich Street, New York, manufacturer of food products, has acquired 10-story building at 43 45 Hubert Street, for new plant, with part of structure for storage and distribution. Cost over $60,000 with machinery, including mechanical-handling equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 23 for two portable electric arc welding sets (Schedule 4758) for Brooklyn Navy Yard; four portable voltmeters (Schedule 4786) for Brooklyn and Philadelphia yards; until April 26, steel rivets (Schedule 4782) for Brooklyn yard; metal joiner doors and windows (Schedule 4621), seven spherical liquid compasses (Schedule 4793); until April 30, seamless steel tubing (Schedule 4810), seven oil and water separators and spare parts (Schedule 4798), motor-driven pumps and spare parts (Schedule 4818) for Brooklyn, Philadelphia and Charleston yards.

Board of Education, Park Avenue and Fifty-ninth Street, New York, plans manual training equipment in new multi-story Manhattanville junior high school at Amsterdam Avenue and 129th Street, for which general contract has been let to George F. Driscoll Co., 550 Union Street, Brooklyn. Fund of $1,100,000, has been arranged for building and equipment. W. C. Martin, Flatbush Avenue Extension and Concord Street, Brooklyn, is architect and superintendent for board.

American Cyanamid Co., 30 Rockfeller Plaza, New York, has approved plans for new plant for mining and milling bauxite on tract of land on Arch Street Pike, near city limits of Little Rock, Ark., where raw material property is located.

Superintendent of Lighthouses, St. George, Staten Island, New York, asks bids until April 22 for 100 automatic non-electric flashers or devices for controlling lighting periods of flashing acetylene beacons and buoys (Proposal 48414); until April 30, lighted-type gong buoy and two light buoys (Proposal 48422).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 30 for two steam tables and counter sections, complete with equipment for naval station, Lakehurst, N. J. (Schedule 4788).

Atlantic Refining Co., 260 South Broad Street, Philadelphia, plans new bulk oil storage and distributing plant at Newark, N. J. Cost over $40,000 with tanks and other equipment.

Railway Industrial Construction & Repair Co., Paterson, N. J., care of Maurice E. Nolan, 129 Market Street, has been organized to manufacture railway equipment and supplies.

Naval Aircraft Factory, Navy Yard, Philadelphia, Commander S. J. Ziegler, manager, has begun expansion and improvements for aircraft and aircraft engine manufacture. New buildings will be erected and equipment installed for rated capacity of about 600 airplanes and 800 engine units a year. Fund of $2,708,000 has been secured for project.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 23 for one motor-driven grinder for Philadelphia Navy Yard (Schedule 4771).

Atlas Supply Co., sheet metal products, has leased about 10,000 sq. ft. in building at 47 40 Metropolitan Avenue, Long Island City, for new plant, recently incorrectly noted in these columns as acquired by Atlas Metal Products Corpn., 150 Varick Street, New York. First noted company has taken over property.

BUFFALO DISTRICT

Board of Chemung County Supervisors, Elmira, N. Y., plans new electric light and power plant for county institutions and other service. Surveys have been authorized. Cost close to $100,000 with equipment.

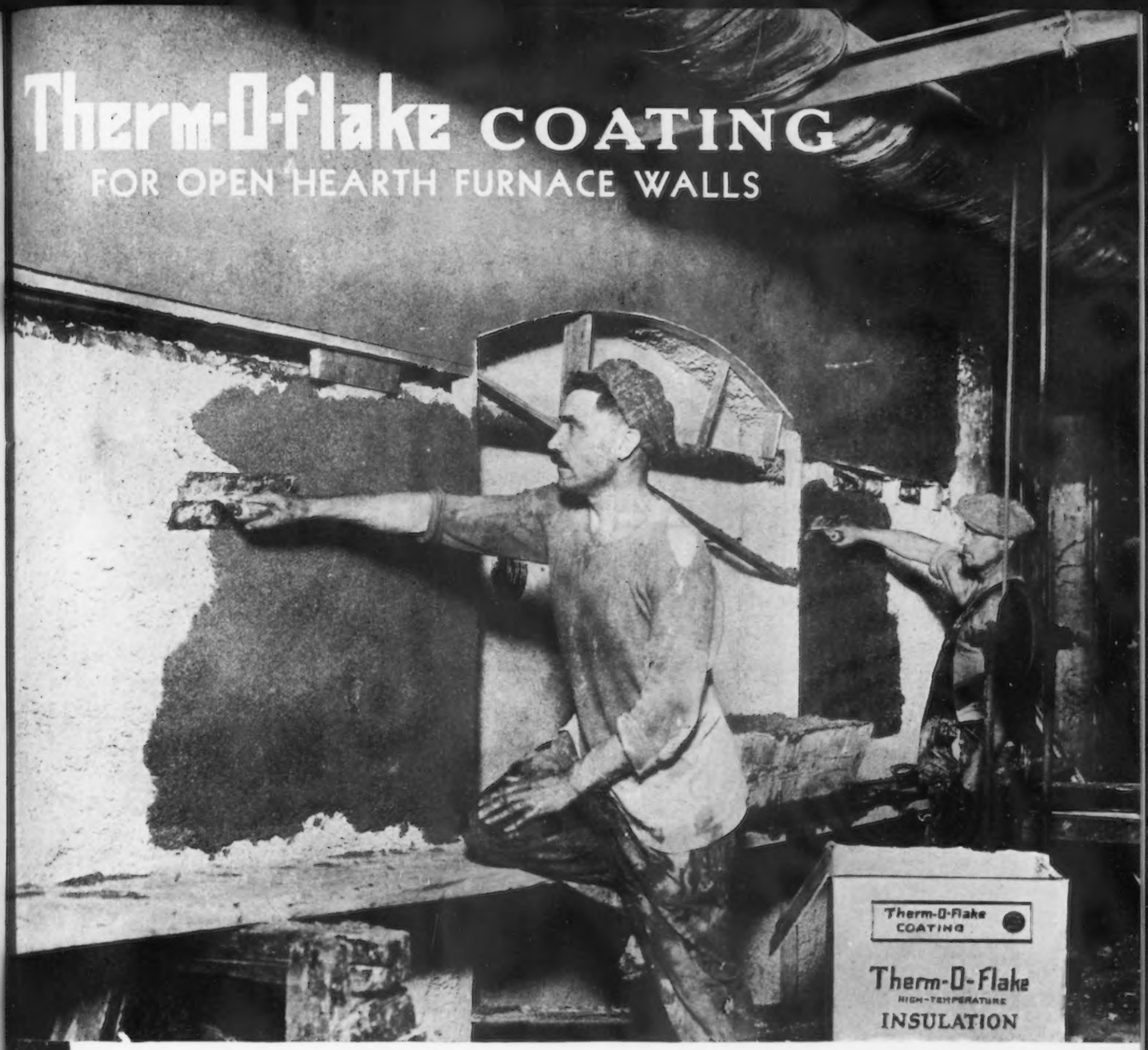
Figurator Corpn., Jamestown, N. Y., has been organized by Arthur W. Adriance and Clive L. Wright, Fenton Building, to manufacture adding and calculating machines and parts.

Dominion Foundries & Steel, Ltd., Depew Street, Hamilton, Ont., has plans for one-story plant units, 50 x 145 ft., 50 x 50 ft., and steam power house, 30 x 40 ft. Cost over $65,000 with equipment. F. Prack, Piggott Building, is architect.

NEW ENGLAND

Board of Selectmen, Westfield, Mass., plans manual training equipment in new multi-story junior high school. Cost about

Therm-O-flake COATING
FOR OPEN HEARTH FURNACE WALLS



THERM-O-FLAKE COATING

- High temperature insulating plaster with a high thermal efficiency up to 2000° F.
- Provides a strong elastic covering for furnace walls. Great adhesive strength and resistance to infiltration.
- So light and smooth that a ton will cover 1600 square feet, one inch thick.
- Preferred for furnace wall insulation in most steel plants. Used above and below the charging floor on nearly 200 open hearth furnaces.
- Used with THERM - O - FLAKE GRANULES on more than 150 open hearth furnace roofs.
- Write for samples and interesting data.

ILLINOIS CLAY PRODUCTS COMPANY, JOLIET, ILLINOIS

Therm-O-flake GRANULES
FOR OPEN HEARTH ROOFS

When You Require
Coolant Pumps - - - - - - - - - -
Specify——
"BROWNIE"

A pump which has no packings to leak, no screens to clog. A pump which is entirely self-aligning. "Open" types (for setting on bottom of tank) and "Closed" types (for mounting on outside of tank) 10-100 G.P.M. A pump which handles anything from coolant, impregnated with grit and chips, to oil.

Write for Bulletin No. 10

THE TOMKINS-JOHNSON CO.
628 N. Mechanic St., Jackson, Michigan

$300,000. Ralph M. Sizer, 24 Chestnut Street, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 23 for one motor-driven steel forming press brake (Schedule 4749), eight motor-driven metal shaping machines (Schedule 4802) for Boston Navy Yard; 12 motor-driven sensitive drilling machines (Schedule 4769) for Newport, R. I., yard; until May 3, eight oil and water separator units and spare parts (Schedule 4795) for Boston, Norfolk, Mare Island and Puget Sound yards.

State Department of Public Welfare, State House, Providence, R. I., plans extensions and improvements in power house at State school at Exeter, R. I., including boiler units, automatic stokers and auxiliary equipment. Cost close to $25,000.

Board of Selectmen, Putney, Vt., is considering new municipal electric light and power plant. Cost over $70,000 with equipment, including distribution lines.

Bureau of Yards and Docks, Navy Department, Washington, closes bids April 24 for two steel radio towers for Boston Navy Yard (Specification 7907).

Atlantic Wire & Iron Works, Inc., Boston, has been organized by Albert H. Sibley, 33 Rockingham Street, Cambridge, Mass., and associates, to manufacture metal specialties, wire products, etc.

Springfield, Mass., has bids under advisement for machine shop equipment for technical high school.

WESTERN PA. DIST.

Hookless Fastener Co., Meadville, Pa., manufacturer of metal specialties, will soon take bids for five-story and basement addition, 50 x 300 ft. Cost about $350,000 with equipment. Wilbur Watson & Associates, 4614 Prospect Avenue, Cleveland, are architects.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, plans extensions and improvements in branch plant at Crystal City, Mo., for production of safety sheet glass. Cost over $300,000 with machinery.

Northeastern Container Corpn., Bradford, Pa., recently organized to manufacture corrugated boxes and containers, has purchased former local plant of Hanley Machine Co., Buffalo, and will remodel for new plant. Unit is two stories, 100 x 150 ft. Cost about $75,000 with machinery.

SOUTH ATLANTIC

Turpentine & Rosin Factors Co., Savannah, Ga., plans new refining plant and turpentine works at Statesboro, Ga., with stills, storage, distributing and other equipment, etc. Cost over $40,000 with machinery.

Central Chevrolet Co., Columbia, S. C., local representative for Chevrolet automobile, has leased two-story building to be erected by Central Investment & Realty Co., Columbia, to include repair and parts department. Cost over $40,000 with equipment.

Kraft-Phenix Cheese Co., 400 North Rush Street, Chicago, will proceed with construction on two-story addition, 65 x 175 ft., to plant at Atlanta, Ga. Cost about $150,000 with mechanical-handling and other equipment.

Continental Packing Co., Franklinton, Ga., food products, will make extensions and improvements in canning plant, including equipment. Cost about $25,000.

SOUTH CENTRAL

Kennebec Distillery Co., Frankford, Ky., has let general contract to J. D. Jennings, 328 East Breck Street, Louisville, for new plant, including power house, machine shop and other structures. Cost about $150,000 with machinery. Carl J. Kiefer, Schmidt Building, Cincinnati, is consulting engineer.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until April 29 for one 20-ton and one 270-ton gentry cranes for Wheeler hydroelectric power plant, and one 250-ton traveling crane for Norris hydroelectric power station.

Newport Industries, Inc., De Quincy, La., manufacturer of turpentine, resin and other naval stores, with headquarters at Pensacola, Fla., will build new four-story refinery for resin production. Cost over $65,000 with equipment.

Board of Water Commissioners, Richmond, Ky., plans installation of motor-driven pumping machinery and accessories, filtration equipment, pipe lines, etc., for extensions and improvements in water system. Cost about $75,000.

Magnolia Petroleum Co., Magnolia Building, Dallas, Tex., plans rebuilding part of oil refinery at Beaumont, Tex., recently destroyed by fire. Loss close to $400,000 with equipment. Company is subsidiary of Standard Oil Co. of New York.

B. F. Goodrich Co., Akron, Ohio, has let general contract to Southwestern Construction Co., 3802 Calhoun Street, Houston, Tex., for two-story factory branch, service and distributing building at Houston. Cost over $45,000 with equipment.

MICHIGAN DISTRICT

Chrysler Corpn., Detroit, has approved plans for one-story addition, 96 x 576 ft., to plant of Dodge Brothers Corpn., Hamtramck, a subsidiary. Cost about $250,000 with equipment.

Eaton Mfg. Co., 9771 French Road, Detroit, manufacturer of automobile springs and kindred automotive equipment, has work under way on addition to increase total floor space to about 157,000 sq. ft. Cost over $45,000 with equipment.

Fassler Welding Machine Co., 424 Stormfeltz-Loveley Building, Detroit, has been organized by Peter W. Fassler, 2911 Burlingame Avenue, and associates, capital $125,000, to manufacture welding equipment and parts.

Wayne County Superintendent of Poor, County Building, Detroit, has plans for new three story equipment storage and distributing building, 80 x 240 ft., at Eloise, Mich. Cost about $150,000 with equipment. Nathaniel O. Gould, Empire Building, is architect and engineer.

OHIO AND INDIANA

Humphryes Mfg. Co., Mansfield, Ohio, manufacturer of pumping machinery and parts, plumbing specialties, etc., is considering one-story addition, 98 x 100 ft. Cost about $60,000 with equipment.

Cedar Valley Distillery Co., Wooster, Ohio, has plans for one-story building, 60 x 150 ft., for storage and distribution. Cost about $50,000 with equipment. On completion of this unit it is planned to build three one-story buildings, each about 70 x 70 ft., for similar service. W. G. Lanphear & Son, 11 Court Street, Buffalo, are architects.

American Products Co., 3265 Colerain Avenue, Cincinnati, manufacturer of industrial and other chemical products, has asked bids on general contract for one-story addition, about 15,000 sq. ft. floor space, for storage and distribution. Cost close to $30,000 with equipment. Carl J. Kiefer, Schmidt Building, is consulting engineer.

Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until April 22 for venturi and vacuum pump control, and fuel cock control dial and handle assemblies (Circular 646); until April 24, pipe thread gage members (Circular 654), 100 ignition manifold assemblies, shielded (Circular 652); until April 25, exhaust collector rings (Circular 656), 15 rotary pumps and motors, gasoline or oil (Schedule 655), 27,000 compensating compass magnets (Circular 653); until April 26, pipe thread gages, thread snap gages, plug thread gages, etc. (Circular 658), 700 fuel pump flexible drive shaft assemblies (Circular 657), and lower station fuselage fittings (Circular 659).

Libbey-Owens-Ford Glass Co., Nicholas Building, Toledo, Ohio, manufacturer of safety sheet glass, is considering extensions and improvements in plant at Rossford, near Toledo, including modernization of present units. Cost close to $150,000 with equipment.

Board of Public Works, City Hall, Goshen, Ind., plans installation of pumping machinery and accessories, settling tanks, digester machinery and other equipment for new sewage disposal works, for which bids will be asked soon. Cost about $450,000. Bemis & Co., 105 West Adams Street, Chicago, are consulting engineers.

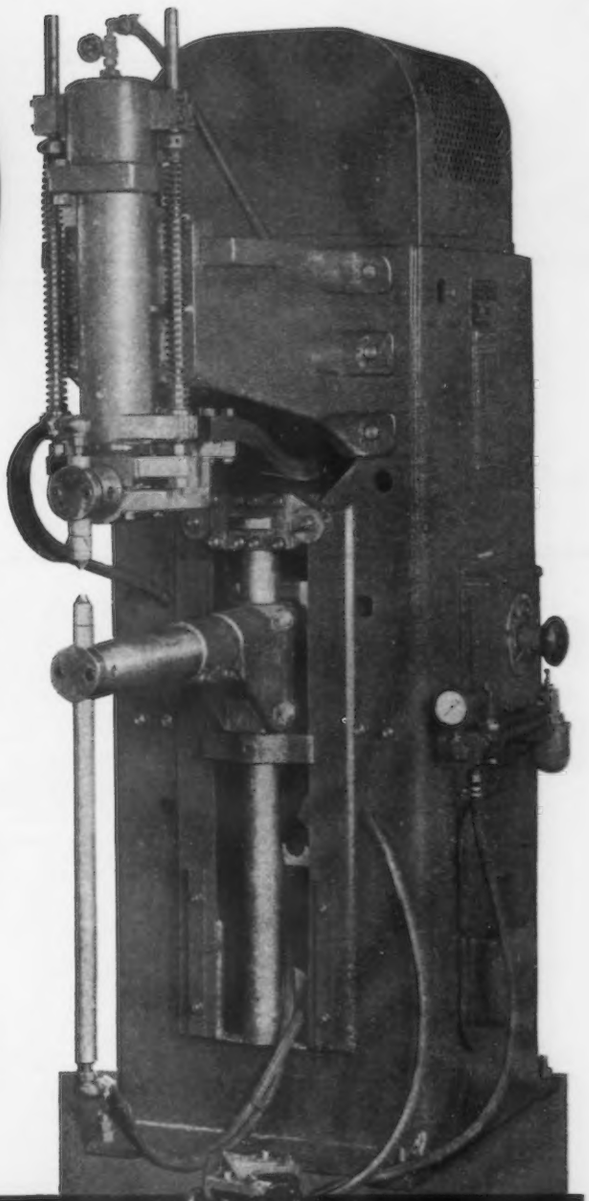
WASHINGTON DIST.

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until May 9 for automobile parts (Circular 128).

Crown Cork & Seal Co., Eastern Avenue and Kresson Street, Highlandtown, Baltimore, manufacturer of metal bottle

THE SPOT WELDER FOR ALUMINUM HAS ARRIVED!

THOMSON-GIBB
SPOT WELDER FOR ALUMINUM
K-24-150



Conventional spot welders are inadequate for welding aluminum on a production scale. It takes machines capable of controlling the variables—heat, pressure and time—within extremely narrow limits to produce uniform results.

This machine is one of the many types of Thomson-Gibb Spot Welders in constant use for welding aluminum in a wide range of gauges. It produces welds that *must* and *do* stand rigid government inspection and tests.

Thomson-Gibb has the right equipment for production welding aluminum and knows how to apply it to the best advantage. May we cooperate on your aluminum welding problems?

A way to manufacture better and cheaper with Aluminum

THOMSON-GIBB ELECTRIC WELDING COMPANY

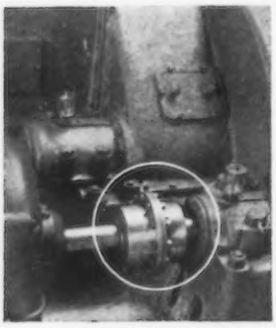
THOMSON PRODUCTION WELDERS GIBB

HEADQUARTERS FOR
MANUAL AND AUTOMATIC
SPOT · SEAM · BUTT · FLASH
PROJECTION · PORTABLE GUN
AND SPECIAL WELDERS

GENERAL OFFICES 162 PLEASANT STREET
LYNN - MASSACHUSETTS
FACTORIES AT LYNN, MASS. AND BAY CITY, MICH.
BRANCH OFFICES
CHICAGO · CLEVELAND · DETROIT · GRAND RAPIDS · HOUSTON
INDIANAPOLIS · LOS ANGELES · MINNEAPOLIS · NEW ORLEANS
NEW YORK · ST. LOUIS · SAN FRANCISCO · SEATTLE · MONTREAL
TORONTO · VANCOUVER · WINNIPEG

FARREL GEARFLEX COUPLINGS

built to stand the stress of heavy duty service

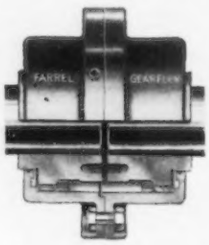


A No. 4½ double engagement type Gearflex Coupling on a rolling mill drive transmitting 200 H.P. at 680 R.P.M.

Farrel Gearflex Couplings are designed on a simple and sound mechanical principle which has been thoroughly tested and proved to be reliable and satisfactory on thousands of drives.

Power is transmitted through strong, accurately generated gears operating continuously in oil. There are no bushings, pins, springs or grids to wear out. Their simplicity, accuracy and rugged construction insure long life and dependable performance.

For complete engineering data, giving ratings, dimensions, weights, list prices, etc., send for a copy of our Bulletin No. 437.



Sectional view of Gearflex Coupling showing gear teeth and oil chamber.

FARREL-BIRMINGHAM COMPANY, INC.

333 Vulcan St., Buffalo, N. Y.

seals and caps, etc., plans four-story addition. Cost about $75,000 with equipment.

United States Coast Guard Headquarters, Washington, asks bids until April 22 for propellers for patrol boats during fiscal year 1936 (Proposal 3282), magneto parts during fiscal year 1936 (Proposal 3280); until April 26, grease gun fittings and lubricating fittings (Proposals AV-3155 and AV-3156); until May 1, copper tubing (Proposal AV-3159); until May 2, copper tubing (Proposal AV-3160).

Marine Corps, Quartermaster Office, Washington, asks bids until April 22 for one horizontal uniflow steam engine and 100-kw. d.c. generator, with switchboard and accessory equipment (Schedule 602).

Maryland Retinning Co., 237 President Street, Baltimore, plans one-story addition, 25 x 100 ft., including improvements in present plant. Cost over $25,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 23 for one motor-driven gear-cutting machine (Schedule 4797) for Portsmouth Navy Yard; one motor-driven apron type bending brake (Schedule 4794) for submarine base; until April 26, shaft revolution indicator equipment and spare parts (Schedule 4734) for Boston, Philadelphia, Norfolk and other yards; one turbine-driven main condenser circulating pump and spare parts (Schedule 4799) for Norfolk yard; fuel oil heaters and spare parts (Schedule 4731), electric storage batteries and spare parts (Schedule 4760) for Eastern and Western yards; until April 30, one motor-driven toolmakers' precision lathe and one relieving attachment (Schedule 4807) for submarine base.

◀ MIDDLE WEST ▶

Armour & Co., Union Stock Yards, Chicago, have filed plans for new six-story abattoir and packing plant, 160 x 238 ft., at Forty-third and Loomis Streets. Cost about $750,000 with equipment. F. A. Lindberg is company architect.

International Harvester Co., 606 South Michigan Boulevard, Chicago, plans new one-story branch assembling plant at Houston, Tex., totaling about 100,000 sq. ft. floor space. Cost over $140,000 with equipment. Houston branch of company is at Commerce Avenue and Hamilton Street.

Hiram Walker & Sons, Inc., Peoria, Ill., have asked bids on general contract for three additions for storage and distribution. Cost over $100,000 with equipment. Smith, Hinchman & Grylls, Marquette Building, Detroit, are architects and engineers.

City Council, Denison, Iowa, Jacob Johnson, city clerk, plans extensions in municipal power plant, with installation of new 250-hp. boiler unit and other equipment. Cost about $30,000.

St. Paul Hydraulic Hoist Co., 292 South Walnut Street, St. Paul, Minn., plans rebuilding part of plant recently destroyed by fire. Loss about $85,000 with equipment.

Chimney Rock Power District, Minatare, Neb., R. O. Chambers, president, is arranging financing in amount of $600,000 for new transmission and distributing systems in Morrill and Scottsbluff counties, for rural electrification throughout Bayard, Neb., area. Plans have been approved by State engineer. H. H. Henningson, Union State Bank Building, Omaha, Neb., is consulting engineer.

Victor Mfg. & Gasket Co., 5750 West Roosevelt Road, Chicago, has taken out a permit for one-story building, 102 x 119 ft., for storage and distribution. General contract has been let to A. S. Low, 510 North Dearborn Street. Cost about $45,000 with equipment. W. H. Farnum, last address noted, is architect.

Marathon Battery Co., 840 Henrietta Street, Wausau, Wis., manufacturer of storage batteries, has plans by Oppenhamer & Obel, local architects, for an addition, 100 x 110 ft., one-story, with sawtooth roof. Cost about $75,000 with equipment.

Paul W. Kutschera, 3448 South Ninth Place, Milwaukee, toolmaker, has organized Tool-Craft Design Service, Inc., with W. C. Hammond and F. J. Haas, to render general tool designing service to machine and production shops.

George Banta Publishing Co., Menasha, Wis., has placed general contract with C. R. Meyer & Sons Co., 50 State Street, Oshkosh, Wis., for printing plant extension, 150 ft. sq., one story. Cost about $100,000 with equipment.

J. J. Stangel Hardware Co., Manitowoc, Wis., wholesale hardware, has placed contract with Hamann Construction Co., local, for warehouse and shipping building to accommodate automotive parts and equipment division. Cost $50,000.

◀ SOUTHWEST ▶

United States Engineer Office, Manufacturers Exchange Building, Kansas City, Mo., asks bids until April 23 for 840,000 lin. ft. of wire strand, ¾ in. diameter (Circular 584).

Chevrolet Motor Co., 3044 West Grand Boulevard, Detroit, has engaged Albert Kahn, Inc., New Center Building, to draw plans for new one story motor parts plant, totaling about 80,000 sq. ft., floor space, with storage and distributing facilities, at Leeds, Mo. Cost over $100,000 with equipment.

Clark Coal Co., Clarksville, Ark., plans rebuilding coal tipple at mining properties recently destroyed by fire. Loss over $25,000 with equipment.

City Council, Cushing, Okla., will soon take bids for new municipal electric light and power plant, including three 750-hp. Diesel engine units, generator sets, cooling tower, transformers and other equipment, also distribution system. Cost about $340,000. W. R. Holway, 302 East Eighteenth Street, Tulsa, Okla., is consulting engineer.

Maytag Southwestern Co., Dallas, Tex., representative for Maytag Co., Newton, Iowa, manufacturer of electric washing machines, has leased building to be erected at McKinney and Griffin Streets for factory branch, storage and distributing plant. Cost about $35,000 with equipment. Eugene Davis, Central Bank Building, Dallas, is architect.

◀ PACIFIC COAST ▶

Douglas Aircraft Co., Santa Monica, Cal., is considering one-story addition, work to be carried out during summer. Cost over $50,000 with equipment.

Fremont Distilleries, Inc., Stockton, Cal., E. S. Granucci, president, has let general contract to O. H. Chain, 41 South Sutter Street, for new distilling plant, about eight miles from city, to include storage and distribution building. Cost over $70,000 including equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 30 for one spot welding equipment (Schedule 4833); until May 3, one complete windlass and spare parts (Schedule 4826), 10 portable ventilating sets (Schedule 4832) for Mare Island Navy Yard.

City Council, Torrance, Cal., asks bids until April 23 for 250,000-gal. elevated steel tank and 170-ft. tower for municipal water service. Taylor & Taylor, 725 South Spring Street, Los Angeles, are consulting engineers.

Golden State Soda Works, Inc., 1715 Fifteenth Street, Sacramento, Cal., plans new one story mechanical bottling plant, 100 x 160 ft. Cost over $45,000 with machinery.

Columbia Distilleries, Inc., 404 Pittock Block, Portland, J. E. Wood, manager, plans new distillery at Salem, Ore., with storage and distributing buildings. Cost over $75,000 with equipment.

Crown Willamette Paper Co., 2945 East Twelfth Street, Los Angeles, has let general contract to Austin Co. of California, 777 East Washington Street, for one-story addition, to be used in part for paper-converting, storage and distribution. Cost about $45,000 with equipment.

◀ FOREIGN ▶

Ford Motor Co., Dearborn, Mich., plans new works at Floresti, Rumania, comprising one-story units for parts production and assembling. Cost over $600,000 with equipment. Company is also planning new assembling plants in Yugoslavia, Bulgaria and Greece.

Municipal Council, Valparaiso, Chile, plans extensions and improvements in electric light and power plant, including new equipment. Power and distributing lines will be extended, to include substation and service facilities. Fund of 40,000,000 pesos (about $2,000,000) has been authorized for project.

City Council, Leicester, England, plans erection of new municipal multi-story abattoir. Fund of $750,000 is being arranged, including conveying and other mechanical-handling equipment.

ABC... FABRICATED AND ERECTED STRUCTURES

ARE LEGION

A.B.C. structures of all types, for all purposes — bridges, buildings, barges, towers, dams, turntables, viaducts, subways—attest to the fact that A.B.C. fabricating and erecting facilities are adequate and the A.B.C. engineering organization competent to meet the demands of any job, however large or difficult, and in any locality, however remote.

AMERICAN BRIDGE COMPANY

GENERAL OFFICES: *FRICK BUILDING • PITTSBURGH, PA.*

Baltimore Boston Chicago Cincinnati Cleveland Denver Detroit Duluth Minneapolis New York Philadelphia St. Louis Salt Lake City

Pacific Coast Distributors: Columbia Steel Company, San Francisco • *Export Distributors:* United States Steel Products Company, New York

United States Steel Corporation Subsidiary

WORTHINGTON

MULTI-V-DRIVE

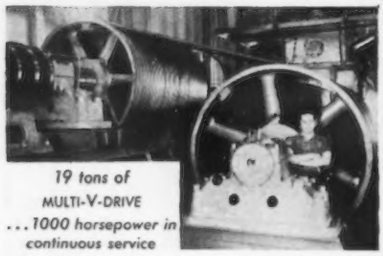
with

54 GOODYEAR

EMERALD CORD BELTS

driven by

Worthington Diesel Engine, Speeds Giant Worthington Centrifugal Dredge Pump

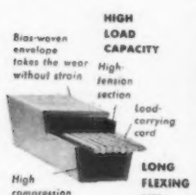


19 tons of MULTI-V-DRIVE ...1000 horsepower in continuous service

THIS is one of the largest V-belt drives in the world. It demonstrates the practicability of high efficiency Multi-V-Drives on heavy-duty machinery, such as ball, rod and tube mills, heavy saw mill and paper mill machinery, crushers, etc. . . . and on many others of every class where even, maximum power is required.

7 pounds of MULTI-V-DRIVE . . . a ¼-horsepower typical unit

From fractional horsepower ratings up, there is a Worthington Multi-V-Drive for every power and purpose.



- Positive Grip
- Permanently Quiet
- Ideal For Close Centers
- Full Efficiency Maintained
- Negligible Maintenance Costs
- Full Performance In Any Position

25,000 stock combinations and unlimited specials

Every drive correctly rated

WORTHINGTON PUMP AND MACHINERY CORPORATION
HARRISON, NEW JERSEY
Offices and Dealers throughout the United States

WORTHINGTON

Hardness Conversions for Carbon and Alloy Steels

(CONTINUED FROM PAGE 21)

mentioned influences. Thus this method gives the most uniform basis for comparisons with other testing procedures. It is true that the oldest of all presently used indentation methods, the Brinell test, has become the predominating of all hardness tests, but its acknowledged lack of accuracy at the higher hardness values places the Vickers undoubtedly before the orthodox Brinell method. In compliance with this known fact, the first column in the conversion table was reserved to denote Vickers (or Firth) hardness numerals.

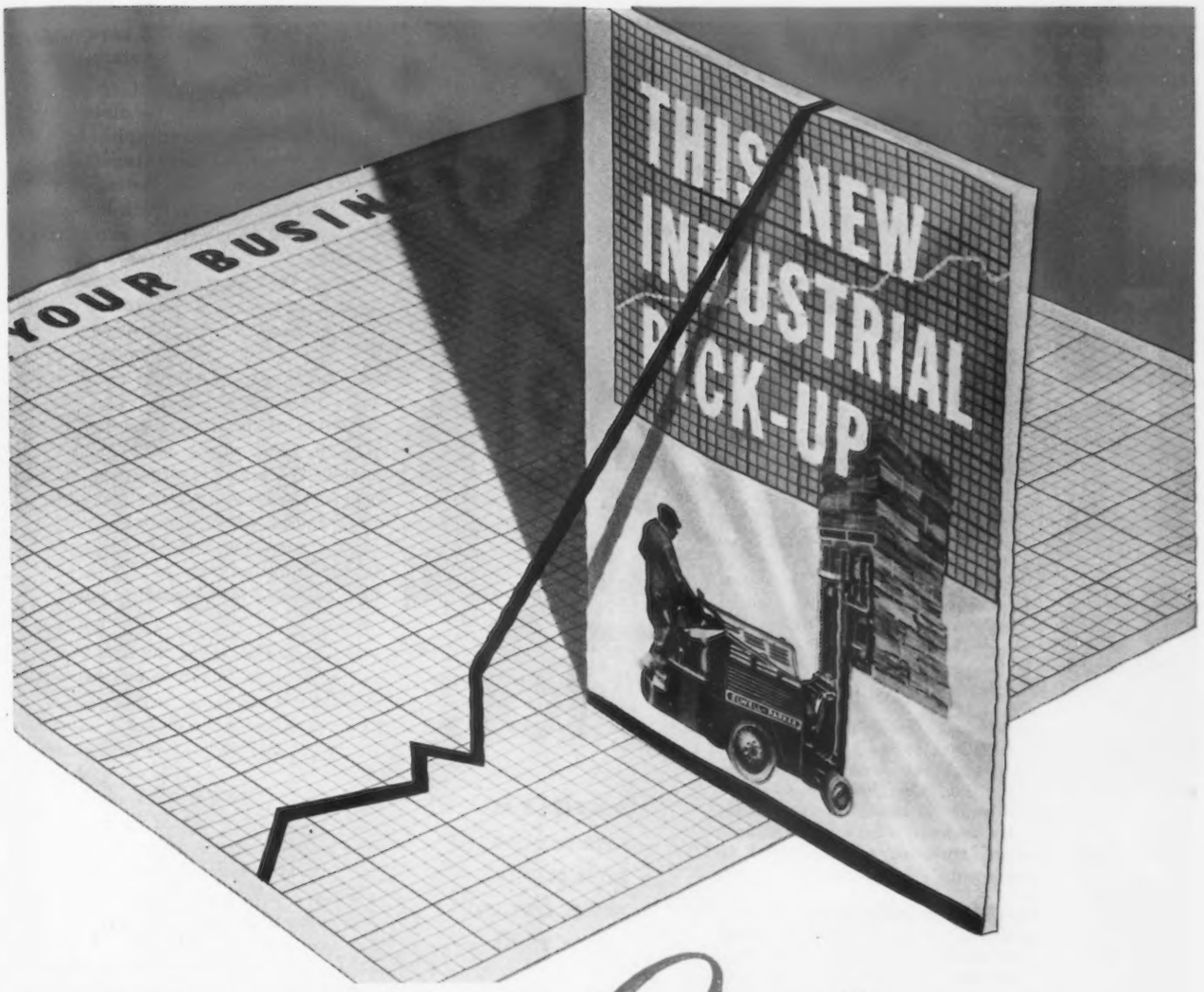
The second, third and fourth columns give figures for the standard Brinell test, the 10 mm. ball being of the Hultgren type; pressures of 3000 and 500 kg. were applied. Since the development of commercial tungsten carbide, Brinell balls have been made and marketed by several producers of this alloy. Carefully conducted tests with this new type and with the old type balls show a much better resistance of the former to deformative forces. True hardness readings are therefore obtained with tungsten carbide balls up to about 800 B.H.N., and a practically linear relationship between the Brinell values and the Vickers numerals makes comparisons of both very reliable. The table indicates the differences between the two types as they exist from 418 B.H.N. upwards.

During the last decade, the Rockwell hardness test has become quite a preferential standard in many American and foreign specifications and laboratories, for which reasons frequent references to conversion data are almost imperative. Many investigators have, for this purpose, prepared tables and diagrams giving figures for the several scales advocated by the makers of the original as well as of imitated Rockwell hardness testers. Due to the similarity of construction of these instruments, Rockwell numerals may be converted into most of the other hardness figures. This is particularly true within the range of C-10 to C-55. Practically all the correlations may be expressed in these limits by almost a straight line. Above C-55 the Vickers-Rockwell, Brinell-Rockwell conversion curves flatten out towards the horizontal axis. This change in directional characteristics of the conversion curve gives cause to a marked decrease in the accuracy of the graphical relationship.

The Rockwell numerals for determinations made on a standard instrument with an ordinary diamond cone of the "brale" type, but with loads of 100 and 60 kg. respectively, may occasionally be found useful and in preference to the normal pressure of 150 kg. Comparisons with other Rockwell instruments check very closely. The same may be said of similar conversions obtained with the Rockwell machines used extensively by some testing laboratories in the United States and in Europe. The reliability of these figures approaches almost the ideal.

Supplementing somewhat the applicability of the standard instrument, the superficial Rockwell hardness tester has been designed to meet testing requirements in connection with very thin specimens, surface layers, etc. Accordingly, a minor load of only 3 kg. and major loads of 15, 30 and 45 kg. are applied. From a survey made, it seems that the load of 30 kg. is probably the most useful one, for which reasons comparative values for a diamond cone ("N-brale") and a standard 1/16 in. steel ball are given in the tabulation. From the tests made by the present author with a few of the existing instruments, the conversions between the standard and the superficial hardness tester are highly satisfactory.

The durometer, developed on the principle of the Rockwell hardness tester by the Aktiebolaget Alpha of Sweden, is frequently used and its measurements published by European investigators. The durometer test consists in forcing an accurately ground 120 deg. diamond cone into the test piece under an initial load of 10 kg. and a final load of 150 kg. The depth of the thus obtained indentation is subsequently measured. The actual depth of the impression designated as a multiple of 0.001 mm. indicates the hardness in accord-



ELWELL-PARKER *Customers:*

YOUR increasing purchases ever since 1906 have stimulated constant improvement and expansion of the Elwell-Parker line. Latest of these developments is the finished handling method known as The Elwell-Parker Pallet System, consisting of Tiering Fork Trucks, transporting unit loads of Boxes, Barrels, Bags and Bales, on Pallets. Operation of the System is fully described in:

"This New Industrial Pick-up," a 32-page booklet with illustrations and text combined into a message of absorbing interest to Executives concerning the large new savings that this new System is effecting.

Your copy of "This New Industrial Pick-up" has already been sent you. The booklet will also be sent gladly to other Executives who request it on their own businesss stationery. The Elwell-Parker Electric Company, 4225 St. Clair Avenue, Cleveland, Ohio.

New ELWELL·PARKER *fork trucks*

ESTABLISHED 1893 • BUILDING INDUSTRIAL POWER TRUCKS SINCE 1906

Handy and How

SO says the "hard boiled" foreman who knows "a thing or two" about saving shop work and assembly time in fabricating such items as die backing plates, stripper plates and bed plates.

He is solidly "sold" on B & L Extra Wide Flats for a score of uses. They take the guesswork out of important jobs, because of their uniformity in straightness, flatness and thickness, which eliminates a lot of time so often wasted in "truing up" the work.

These handy sections are available in widths up to 12″ and in thickness up to 2″—other sizes supplied on special order. True in size and section, B & L Extra Wide Flats make a good foundation for precision equipment.

There is one thing that B & L Steel does well—it always fits the job, simplifying the fabrication of your product. Try B & L on your next steel order.

COLD DRAWN BARS
AND SHAFTING
ULTRA-CUT STEEL
SPECIAL SECTIONS
ALLOY STEELS

BETTER MADE STEELS
LABORATORY TESTED

BLISS & LAUGHLIN, INC.
HARVEY, ILL. *Sales Offices in all Principal Cities* BUFFALO, N.Y.

ance with the Alpha scale. Although this method of representing hardness is contrary to all other indentation methods, which specify higher degrees of hardness with a higher numeral, it eliminates negative hardness numerals as is the case with low Rockwell hardness on the "C" scale. Conversions, especially with reference to the Rockwell, are accurate.

Monotron Data Are Accurate

For some reason beyond the criticisms of this article, the Monotron hardness figures have been virtually omitted from all comparative tests and tables published in recent years. The only two conversions ever computed were those of the manufacturers and a diagram prepared by Professor N. N. Sawin of Czechoslovakia and published by the American Society for Metals. The agreement between these two with the values observed by the writer is satisfactory for practical purposes. This is especially true when testing hard and very hard metals or surfaces.

Dynamic methods of testing hardness, which shall be discussed in the following paragraphs, have several important advantages over static methods. The testing machines are invariably much lighter, most of the commercially exploited instruments being portable. This enables the operator of dynamic hardness testers to examine the heaviest pieces. Practically none of the previously mentioned principles of hardness testing embodies such desirable features. The construction of dynamic machines being in most cases simpler than that of the static instruments, several of the kinetic testing machines have found adherents particularly in the shop because of simplicity in handling as well as for a low first cost and low operating cost.

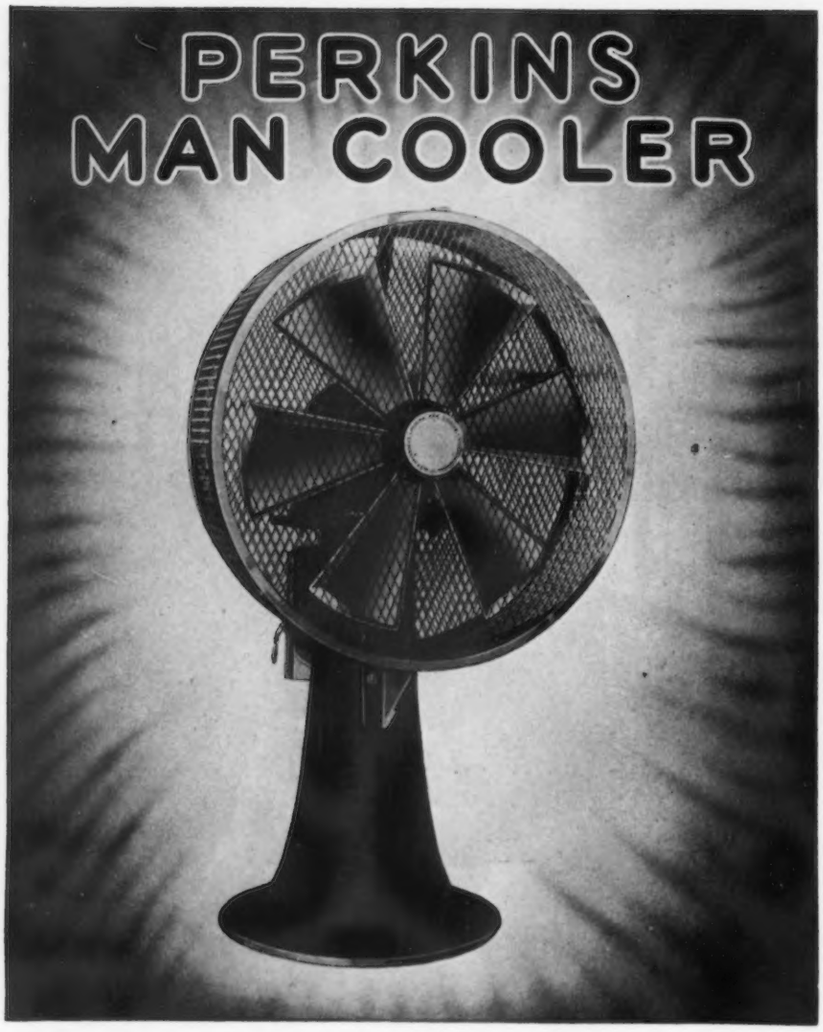
The generally accepted Brinell test was undoubtedly the first technological test which was adopted in dynamic hardness testing. Early after its introduction as a static test, portable Brinell testers were designed on the basis of applied dynamics. Since it was not possible to produce precisely a pressure of three tons upon the steel ball, it was soon determined that a vicious blow by means of a hammer upon a suitable plunger bearing the 10 mm. steel ball and comparisons between the indentations produced simultaneously upon the tested article and a test rod of known hardness give a fairly reliable index of Brinell hardness. The Poldi Steel Corpn. hardness tester and several others belong in this group. These instruments give direct Brinell readings and consequently no conversions are essential. In the conversion table herein the standard values for Brinell hardness are used without any corrections.

Drop-hardness, which is numerically expressed by the specific work of displacement, has so far received very little attention by metallurgists and testing engineers in the United States. Its usefulness for many purposes of modern production control, research in the study of hot-hardness, etc., seems to warrant many more generalizations than has been the case in the past. The first conversion diagram of dynamic and static Brinell numerals has been determined and published by the inventors of the drop test, Wust and Bardenheuer. The original apparatus, however, used a wire guide to direct the fall

DEPENDABLE

NICHOLSON
U.S.A.
MADE IN U.S.A.

Genuine
NICHOLSON
FILES



PERKINS MAN COOLER blows heat away. Because cold air is not introduced from the outside, its invigorating breeze does not chill. It produces refreshing recirculation of air of the same temperature in which the men are working.

B. F. PERKINS & SON, Inc., HOLYOKE, MASS.
ENGINEERS AND MANUFACTURERS

of the weight bearing the steel ball upon the specimen. This deficiency affected the precision of the machine and was later obviated by a different construction of the apparatus. At the same time, the original 300 to 500 mm-kg. were reduced to only 100 mm-kg. The latter change eliminated occasional breakage of the 5 mm. steel ball especially when testing hard steels or metals. Both alterations of the instruments account for slightly different values in the newest conversion data in comparison with the diagrammatic values of Wust and Bardenheuer.

Difficulty With Shore Numbers

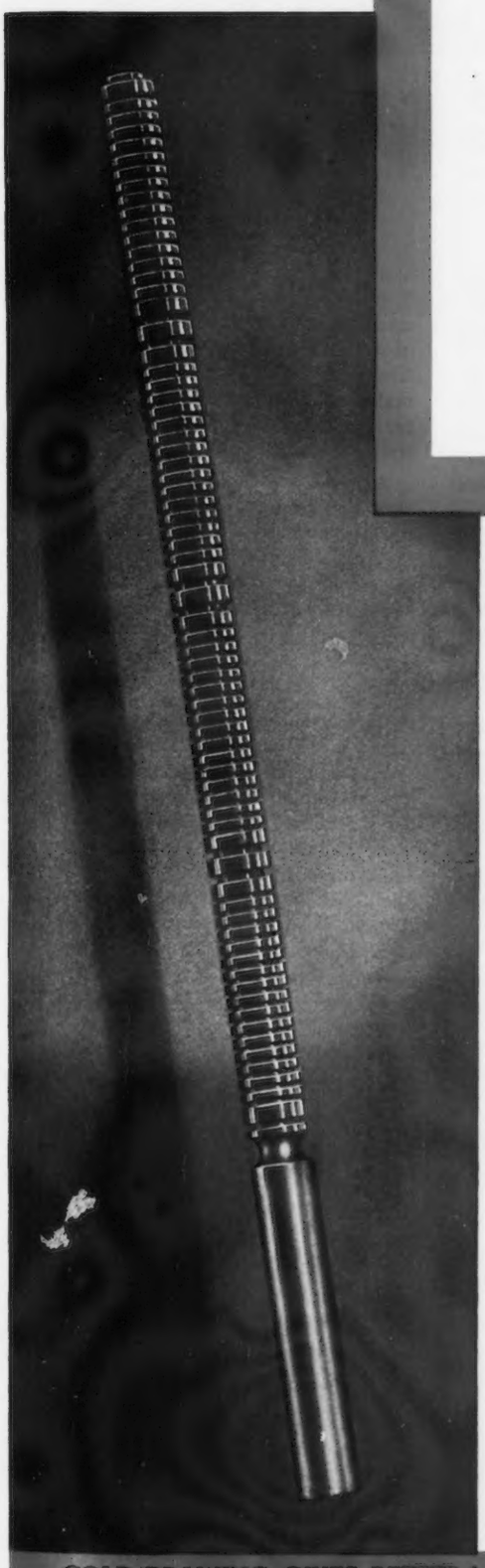
The Herbert Pendulum hardness tester has found its way into several of America's leading metallurgical laboratories because of its precision and ability to test very small specimens, ranging in hardness from the softest metals to super-hard materials. When releasing the 4 kg. pendulum, bearing either a 1 mm. diamond ball ("D") or a 1 mm. steel ball ("S"), the time (in seconds) required for ten complete swings is accurately measured by means of a stop watch and recorded as "time hardness". The accompanying table gives both hardness numerals in comparison with other relative figures.

In compiling readings taken by means of the Shore scleroscope, the author frankly admits that he experienced difficulties in coordinating the resulting values with measurements of other instruments. In recent years some eight or nine Scleroscope-Brinell conversion diagrams and tables have been worked out and published by independent authors and laboratories, but there seems to be a conspicuous lack of agreement between the reported values. To cite a specific case: A Brinell hardness of 401 corresponds in terms of scleroscopic numerals to a Shore hardness of 55 (Holden), 56 (McMullen, 1933 National Metals Handbook, International Nickel Co.), 60 (Shore) and 67 (Wallichs, Holbruch, Hruska, etc.), i.e., a difference of nearly 18 per cent.

As some sort of compromise, the present writer obtained and correlated scleroscope readings from 11 different instruments by using the principle of frequency curves according to E. J. Janitzky. Additional published data from independent Brinell-Scleroscope conversion tables were also included in the computation. The resulting curve indicates that the figures as published in the National Metals Handbook and those of the first mentioned authorities are apparently too low, whereas those of the last three investigators seem to be higher than the average would indicate.

A small portable hardness tester marketed as "Duroskope" has recently been introduced as a shop instrument for routine control of heat treated stock, tools, wire, sheets, etc. It consists, in principle, of a 3-in. pendulum, the rebound of which is indicated in angular degrees and serves thus as index of surface hardness. The reported numbers check well against those of other laboratories and also with those of the manufacturers. The portability, size and other operating characteristics of the Duroskope exclude laboratory precision of the obtained results.

The above summary concludes the description of the current



A .0005" TOLERANCE JOB

WITH J&L IMPROVED HIGH SULPHUR BESSEMER SCREW STOCK

A NEW PART MADE OF STEEL . . . The requirements of precision and fast cutting necessary in the production of this radio condenser shaft are now being met by the use of J & L Improved High Sulphur Bessemer Screw Steel. A more expensive material was previously used for this part. Thus, a very worth while economy is effected by this new application of a J & L steel product. The stock is ⅜" round. It is machined at a surface speed of between 100 feet and 120 feet per minute, working to a tolerance of .0005" on the small grooves.

The exceptional machinability which characterizes J & L Improved Bessemer Screw Steel is found in both S.A.E. 1112 and J & L Special High Sulphur Bessemer Screw Steel. This material can be supplied magnetically tested for surface imperfections, at a slight extra charge. Write for descriptive bulletin.

J&L *Improved* BESSEMER SCREW STEEL

No Change in Chemistry or Physical Properties

JONES & LAUGHLIN STEEL CORPORATION

American Iron and Steel Works

PITTSBURGH, PENNSYLVANIA.

COLD DRAWING GIVES BETTER MACHINING QUALITY

J&L STEEL

OTHER J & L PRODUCTS: *For Manufacturing:* Bars, Shapes, Plates . . . Forging Steel . . . Jalcase Steel . . . Shafting . . . Tubing . . . Cold Heading Wire . . . Spring Wire . . . Tin Plate and Black Sheets, Tin Mill Sizes . . . *For Construction and Maintenance:* Fabricated Structural Work . . . Seamless and Welded Pipe . . . Concrete Reinforcing Bars . . Structural Shapes, including Junior Beams and Light Weight Channels.

known and utilized methods of testing the hardness of metals. While there exist numerous other methods of ascertaining hardness by means of static or dynamic procedures, the above description probably includes all the commercially or technically important methods.

In addition to static and dynamic methods of hardness testing, some investigators have used various scratch procedures to determine surface characteristics of metals and alloys. The success or failure of these scratch tests depends, however, on several variables, all of which rank high in their influence upon the ultimate hardness numeral. Pressure, uniformity of the scratching point, identical speed of the scratch, errors in reading the width of the scratch, surface properties of the tested specimen, etc., are just a few of the derivatives which add to the limited reliability and precision of the known scratch methods. Whether one applies the crude method of hand scratching or endeavors to tackle the highly dexterous micro-scratch, some deficiency due to one or several of the above influences makes a more coherent applicability of the known scratch tests of rather limited value. Elaborate machinery has been developed for actually producing and recording something like standardized scratches, but of all these devices and processes it was only the simple Moh scratch hardness scale and method that has actually survived as an exceedingly cheap means to classify hardness of natural and artificial matter. Several Moh indices are included in the accompanying table.

Westinghouse Electric & Mfg. Co., East Pittsburgh, has received contract from United States Navy Department, involving approximately $1,750,000, for electrical equipment for 18 1500-ton destroyers. The equipment includes turbo generator sets, regulators and switchboards, which are to be installed in the new vessels now under construction in Navy yards. All of the apparatus will be manufactured at Westinghouse plants at East Pittsburgh, South Philadelphia and Newark, N. J.

Knapp Brothers Mfg. Co. has removed its general offices from 605 West Washington Boulevard, Chicago, to 220 Scott Street, Joliet, Ill.

Massive Machine Parts Made of Welded Rolled Steel

(CONCLUDED FROM PAGE 19)

tant roles. The first is that of relieving stresses which result from the welding process. The second is that of providing a very practicable means of removing distortion in the part and thereby bringing it to form and dimensions that are fully consistent with subsequent operations, which often involve the machine shop.

Knowledge of machine use and design, layout, weld design, tacking, welding practice and normalizing methods results in certainties when building up a 56,000-lb., 43-ft. bed section for an 85-ft. milling machine. Crowns, weighing 77,000 lb., for use on large double or triple-action presses, afford excellent examples of design, welding and normalizing practices. They are built of rolled steel sections and some castings are used. Gear housings, and even the gears are made of welded rolled steel. As is usually the case, the matter of relative cost as compared with other materials and processes is a matter for individual investigation of the problem at hand.

All machine parts illustrated in this article were either produced by Danly Machine Specialties, Inc., or A. O. Smith Corpn.

Drafting Table and Coaster Chair Unit

AVOIDANCE of diverted attention is stressed for new "Steelwork" drafting room equipment offered by the Hamilton Mfg. Co., Two Rivers, Wis. Simple adjustments of board, free-wheeling lights and chair are said to represent the extreme in work-convenience.

Welded steel construction is used in the framework. The drawer units are wood; the drawers themselves have steel fronts. California sugar pine is used for the boards; cadmium plated steel end-cleats are attached for parallel rule device and serve as accurate surfaces for T-squares.

The coaster drafting-chair feature is illustrated below. The chair unit assembly provides for practically effortless lateral movement in front of the drafting table and permits both forward and backward movement through a pivot in the lower part of the frame. The seat is adjustable for height and for distance from the board. The front legs are supported on a lateral track attached to the table and have ball-bearing fibre wheels running in a channel guide. The rear legs have ball-bearing floor casters. Three adjustable, ball-bearing light units may be attached to the back of the board.